Feasibility of the

Redlands Water and Power Company

Pumpline Replacement Project

Sponsored by Redlands Water and Power Company

Prepared by

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List of Appendices

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Feasibility Study
Redlands Water and Power Company
Pumpline Replacement Project

Background

Purpose

The Redlands Water and Power Company (RWPC) provides irrigation water to much of the Redlands Area in the Grand Valley of Colorado. The Redlands is predominantly located on bench lands high above the Colorado and Gunnison Rivers, requiring most of the irrigation water to be pumped. RWPC diverts water from the Gunnison River into the Redlands Power Canal which conveys between 750 and 850 cfs to their hydroelectric facility and adjacent pumping plant (Pump Station #1). Approximately 60 cfs is pumped onto the bench lands through a 48" concrete-lined steel pipe known as the "pumpline". The remaining water is run through the hydroelectric facility to both power Pump Station #1 and provide a revenue stream for the company, as all power not used for pumping is sold to Xcel Energy.

Originally installed in 1944, the condition of the pumpline has deteriorated, leading to leaks and requiring frequent repair. In 2007, approximately 550 feet of the upper end of the pumpline was replaced. Replacement of the remaining ~1000 feet of pumpline was deferred and now needs replacement as well. If the pumpline were to fail, the majority of the RWPC service area would not receive irrigation water.

Study Area Description

The Redlands Water and Power Company provides irrigation water to 1970 acres of land (per 2015 data available on CDSS), approximately 72% of which is used for residential landscaping. Pasture grass represents 26% of irrigated acres while Orchards and Vineyards combine for the remaining 2% of irrigated acres. The entirety of the service area is South of the Colorado River and West of the Gunnison River. A map of the Redlands Water and Power service area and a project map can both be found in Appendix A.

The Redlands is a census-designated place with demographic data available. The RWPC service area includes areas that are part of the City of Grand Junction, which are not included in the Redlands census-designated area. The socio-economic statistics presented are for the Redlands rather than the entire service area and come from ACS 2014-2018 from the State Demography Office.

- Population: 9,036
- Area: 15.6 square miles (579.2 people per square mile)
- Median Household Income: $72,556
- Unemployment: 6.65%

Previous Studies

Repair or replacement of the Pumpline was identified in the "Redlands Water and Power Company Water Management Plan 2014-2015" (WMP). The document, funded through a USBR Field Services Grant, identified the urgent need for Pumpline repair or replacement with a suggested completion date of 2018 due to frequent repair, maintenance, and increased risk of failure. The WMP cites the "Feasibility Study of Irrigation Facilities" (Western Engineers, 1989), which mentioned complete replacement of the Pumpline as part of a larger infrastructure project.

More recently, repair/replacement of the Pumpline was recommended in the "Pump Station No. 1 Replacement Feasiblity Study" (J-U-B Engineers, 2019). The report states, "the current condition of the pumpline coupled with its importance within the system, merits its replacement," and identified Pumpline Replacement as the initial phase of the Pump Station No.1 rehabilitation/replacement.

Project Sponsor

The Redlands Water and Power Company is a small irrigation and power provider for the Redlands area of the Grand Valley of Colorado. It was established in 1905 as "The Redlands Company". The company is classified as a nonprofit corporation under general state laws and the Non-Profit Corporation Act, including Section 34-21-36 of the Colorado Revised Statues.

The Articles of Incorporation (provided in Appendix C) allow the company to issue shares. At present there are 5759 "parity" shares divided amongst the system, and there are approximately 600 headgates served by the shares. Due to the demographics and service area served by RWPC, shares are often owned by subdivisions and homeowners' associations. The exact number of water users is unknown, but 1089 distinct entities own shares.

Water Rights

Water Availability

Redlands Water and Power relies entirely on surface water diversions from its diversion on the Gunnison River just outside of Grand Junction, CO (see Project Map in Appendix A). The RWPC water rights portfolio is comprised of three separate water rights on the Gunnison River, with appropriation dates ranging from 1905 to 1994. The two senior rights (1905 and 1941) total 750 cfs; the total decree with all three rights is 850 cfs. Table 1, below, provides a summary of RWPC water rights.

Table 1. Summary of Redlands Water and Power Water Rights

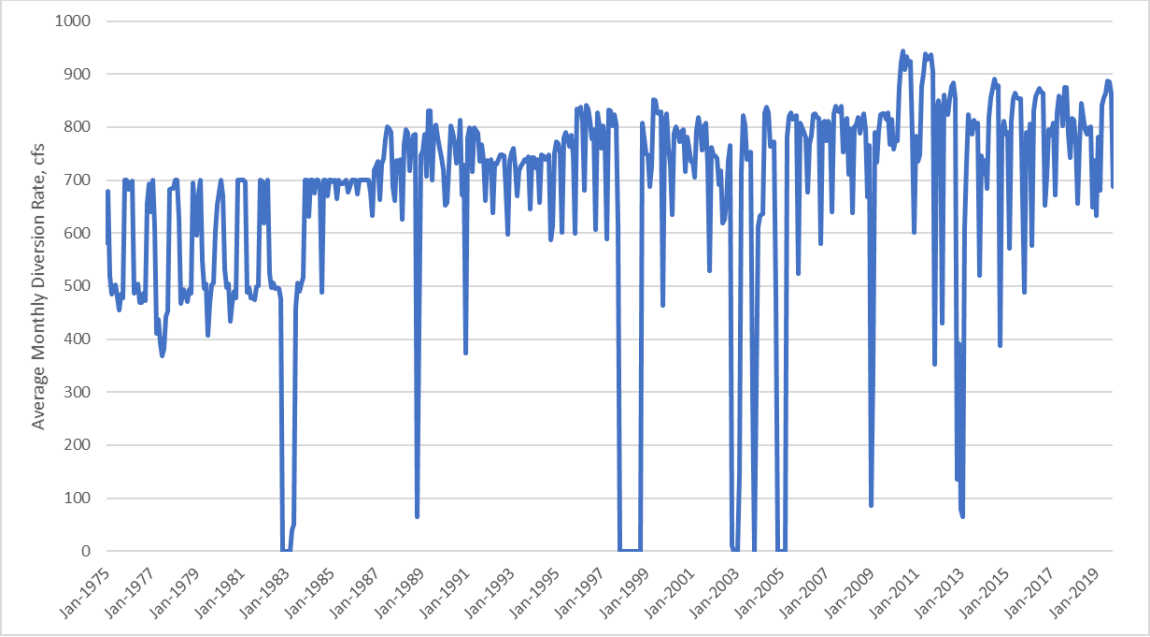
WATER RIGHTS SUMMARY					
ADMINISTRATION NUMBER	DECREED AMOUNT (CFS)	APPROPRIATION DATE	ADJUDICATION DATE	ADJ. TYPE	COMMENTS
22283.20300	670.0	1905-07-31	1912-07-22	Absolute	60 cfs decreed to irrigation, 610 cfs decreed for commercial use
34419.33414	80.0	1941-06-26	1959-21-7	Absolute	Decreed for Irrigation, Commercial, Domestic, and Stock
52869.00000	100.0	1994-10-1	1994-12-31	Absolute	Decreed for Power Generation
TOTAL WATER DECREE (CFS):	850.0				

State Records (available on the Colorado's Decision Support Systems website) are available from January 1975 through October 2019. During this period, the average diversion has been 500,090.6 ac-ft/year; the average diversion for the past 10 years (since 2010) has been 558,813.5 ac-ft/year. Table 2 tabulates the average RWPC monthly diversions since 2010 (complete records of average monthly diversions are available in Appendix B). Figure 1 displays the average monthly diversion rate since 1975.

Table 2. Average Monthly Diversions 2010-2019

	Redlands Power Canal Diversion (WDID = 4200541) Monthly Average Flow Rates (cfs)					
	January	February	March	April	May	June
2010	758.7	776.5	774.3	874.9	922.6	944.1
2011	783.8	735.3	747.2	876.2	900.8	938.5
2012	849.5	830.8	429.9	860.4	833.4	823.6
2013	79.8	65.6	609.6	729.6	824.4	795.6
2014	712.5	736.6	683.8	818.8	855.1	873.7
2015	787.4	790.9	571.7	812.0	853.5	864.1
2016	731.9	805.9	576.0	830.5	858.0	865.6
2017	785.3	807.5	672.6	828.1	858.2	851.2
2018	813.5	767.6	655.7	768.6	845.5	819.1
2019	633.0	782.1	680.6	840.8	854.9	865.0
Monthly Average	**693.5**	**709.9**	**640.1**	**824.0**	**860.6**	**864.1**
	July	August	September	October	November	December
2010	908.1	934.0	917.9	923.8	785.6	601.8
2011	927.9	930.8	936.6	904.2	352.1	830.7
2012	854.0	876.2	882.9	854.5	134.8	390.7
2013	787.0	813.7	799.0	807.8	520.2	746.1
2014	891.2	875.2	878.2	388.2	782.2	811.4
2015	856.2	853.4	853.8	668.5	488.1	790.1
2016	872.8	866.0	863.4	652.0	707.5	795.5
2017	801.9	874.7	874.8	788.8	743.2	816.6
2018	795.7	786.9	799.1	800.8	649.6	737.5
2019	886.4	885.1	862.8	688.3		
Monthly Average	**858.1**	**869.6**	**866.8**	**747.7**	**573.7**	**724.5**

Figure 1. Average Monthly Diversions Since 1975



Water Supply Demands

Demands within the Redlands Water and Power service area will likely stay consistent during the 10-year term of the project loan. Anticipated population growth in the Grand Valley should result in increased development in the Redlands area, likely replacing current agricultural uses with landscape irrigation uses. Consumptive use changes coupled with potential future improvements in conveyance efficiency could decrease the total consumptive use per acre on the RWPC system. This could manifest in increase water use by the hydroelectric facility and a consistent total diversion from the River. There is no projected water supply deficit on the RWPC system during the term of this loan.

Project Description and Feasibility

The purpose of the project is to ensure that RWPC can lift water from the Redlands Power Canal to the First Lift Ditch; the inability to supply water to the First Lift Ditch would result in a loss of irrigation water for the majority of the RWPC service area. The deteriorating condition of the existing pumpline threatens the continued ability to supply water to the First Lift Ditch. As such replacement or rehabilitation of the existing pumpline is needed.

Analysis of Alternatives

During the initial planning of the pumpline project three alternatives were considered.

1) No action
2) CIPP lining of the existing pumpline (rehabilitation)
3) Installation of a new pipe to serve as the pumpline (replacement)

- ***Alternative No. 1*** was **not selected**, as the threat of failure of the existing pumpline was deemed unacceptable by the RWPC Board.

- ***Alternative No. 2*** would involve excavating pits at both ends of the pumpline to install a CIPP liner through the pumpline, and minor repairs of the existing pumpline overshot piers. Discussions with CIPP contractors indicated that only predominantly straight sections could be lined, requiring new steel pipe from the base of the overshot to Pump Station #1 as part of the project. Multiple contractors were contacted, and the average CIPP installation estimate was used to generate a comprehensive alternative cost estimate. Total project costs were estimated at $987,000. This alternative was **not selected** based on cost. The alternative, however, does mitigate risk of pumpline failure and accomplishes the goals of the project.

- ***Alternative No.3*** was **chosen** as the preferred alternative as it mitigated the risk of pumpline failure and was forecasted to be cheaper than lining the existing pipe (Alternative No. 2). Further detail of this alternative is provided below.

Selected Alternative

After settling on Alternative No.3, multiple design iterations were considered to provide acceptable performance at a low cost. The current iteration consists of new, coated steel pipe from the outlet of Pump Station No.1 to an HDPE transition midway along the length of the Pumpline. Also included in the design is replacement of the overshot pipe and rehabilitation of the overshot structure. The new pumpline will be constructed parallel to the existing pumpline (within RWPC property) to minimize disposal costs. All services/turnouts will be replaced as part of the project and constructed in a manner that will allow for the future installation of ultrasonic flowmeters. A mainline ultrasonic flowmeter with associated appurtenances is included with the design.
The designed alternative has the following benefits:

- Full utilization of company owned 48" steel pipe
- Pumping through HDPE requires less energy than most pipe materials, which will decrease annual pumping costs
- HDPE pipe fusion results in a seamless pipe, minimizing potential leak locations
- HDPE's flexibility decreases the need for fittings, saving cost
- HDPE is resistant to abrasive fluids, including silt-laden irrigation water

The 90% Design Plans, included as Appendix D, provide maps, design features, pipeline plan and profiles, etc. The plans were developed collaboratively between RWPC and J-U-B Engineers, using a subcontracted design-level survey, and multiple engineer site visits. The entire project is contained within Redlands Water and Power Company property. Table 3, below, provides the most recent cost estimate for the Selected Alternative.

Table 3. Pumpline Replacement Project Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Price	Amount
Indirect Costs					
1	Design Plans and Specifications	LS	1	$ 30,000.00	$ 30,000.00
2	Construction Management	LS	1	$ 15,000.00	$ 15,000.00
Indirect Costs - **Total**					$ 45,000.00
RWPC Supplied Materials and Subcontracted Items					
3	48" Steel Pipe	LF	195	$ -	$ -
4	Steel Pipe Coating	LF	195	$ 136.23	$ 26,564.85
5	48" DR 21 HDPE Pipe	LF	85	$ 159.32	$ 13,541.79
6	48" DR 32.5 HDPE Pipe	LF	795	$ 104.76	$ 83,281.26
7	4" DR 17 HDPE Pipe	LF	775	$ 2.41	$ 1,863.88
RWPC Supplied Materials and Subcontracted Items - **Subtotal**					$ 125,251.78
RWPC Supplied Materials and Subcontracted Items - **15% Contingency**					$ 18,787.77
RWPC Supplied Materials and Subcontracted Items - **Total**					$ 144,039.54
Contracted Items					
8	Mobilization	LS	1	$ 25,000.00	$ 25,000.00
9	Imported Foundation Material	TON	27	$ 90.50	$ 2,443.50
10	Imported Initial Backfill Material	TON	256	$ 64.50	$ 16,512.00
11	Remove and Dispose of Exist 48" Steel Pipe and Thrust Blocks	LF	438	$ 60.66	$ 26,568.13
12	Excavate for, Install, Backfill for, and Compact for 48" DR 32.5 HDPE Pipe	LF	795	$ 98.20	$ 78,069.00
13	Excavate for, Install, Backfill for, and Compact for 48" DR 21 HDPE Pipe	LF	85	$ 103.00	$ 8,755.00
14	Furnish and Install Mainline HDPE Fittings	LS	1	$ 13,192.30	$ 13,192.30
15	Install, Backfill for, and Compact for 4" DR 17 HDPE Pipe	LF	775	$ 13.00	$ 10,075.00
16	Furnish and Install 4" Fittings and Appurtenances	LS	1	$ 11,527.60	$ 11,527.60
17	Excavate for, Install, Backfill for, and Compact 48" Steel Pipe	LF	195	$ 470.36	$ 91,719.23
18	Furnish and Install 10" Steel Fittings (including wyes, pipe, and flanges)	LS	1	$ 8,477.50	$ 8,477.50
19	Furnish and Install 48" Steel Fittings (including bends, wyes, blind flanges and manways)	LS	1	$ 140,720.20	$ 140,720.20
20	Furnish and Install Mainline Flowmeter and Appurtenances	EA	1	$ 19,249.60	$ 19,249.60
21	Furnish and Install Steel Pipe Overshot and Appurtenances (Pipe Excluded)	LS	1	$ 67,864.00	$ 67,864.00
22	Furnish and Install Turnouts	EA	9	$ 5,000.00	$ 45,000.00
23	Furnish and Install Concrete Thrustblocks	EA	2	$ 5,647.80	$ 11,295.60
24	Furnish and Install Cathodic Protection	LS	1	$ 7,292.50	$ 7,292.50
Contracted Items - **Subtotal**					$ 583,761.16
Contracted Items - **15% Contingency**					$ 87,564.17
Contracted Items - **Total**					$ 671,325.33
Grand Total (rounded)					**$ 860,000.00**

Implementation Schedule

Following the completion of "Pump Station No. 1 Replacement Feasibility Study" (J-U-B, 2019), the RWPC Board began the process of design and funding acquisition for the Pumpline Replacement Project. RWPC contracted J-U-B Engineers to provide design, specifications, and contract documents beginning in October 2019. The plans are currently awaiting their 90% review, with no major changes anticipated. As-such, the implementation schedule will not include design and will assume final design to be completed without interruption to the proposed implementation schedule. Table 4 provides a rough breakdown of major milestones in the project implementation process.

Table 4. Implementation Schedule

	Approximate Timeframe
CWCB Acceptance of Design/ Specifications/Contract Documents	June 2020 - July 2020
Bid Process (Including Final Award and Contracting)	July 2020 - August 2020
RWPC Material Acquisition	July 2020 - October 2020
Construction	October 2020 - December 2020

Impacts

The impacts caused by the Pumpline Replacement Project are expected to be minimal, as the project will allow the status quo of water deliveries to be maintained.

Impacts on Manmade Environment – Construction of the pumpline is expected to impact thru traffic for the three residences that utilize the project area as access. The contractor will be responsible for providing notice to all affected parties and allowing for access to local traffic. Traffic control on Broadway has been discussed with CDOT and is not anticipated as a need for this project.

One potential utility conflict has been identified with a domestic waterline that provides water to local residences. This conflict is not anticipated to negatively impact the domestic service (though it may require temporary shutdown) and will not negatively impact the pumpline itself.

The new pumpline will parallel a fence and an overhead powerline. The electric utility has been notified of the plans and was not concerned given the offset between the pumpline and their utility. The contractor will be responsible for taking the proper care and precautions for working near overhead power lines.

Impacts on Natural Environment – The extents of disturbances associated with project construction are not expected to encroach on any previously undisturbed areas. While there isn't expected to be any significant impact on the natural environment, the contractor will be responsible for submitting a Storm Water Pollution Prevention Plan (SWPPP) which will help to ensure that impacts to the natural environment are minimized.

Institutional Feasibility

Entities that are, or may be, involved in the design, construction, and financing of the project include:

Redlands Water and Power Company (RWPC) – financing, general administration, project management
J-U-B Engineers (JUB) – Design, bid phase assistance, assistance with As-Built documentation and project closeout
Colorado Water Conservation Board (CWCB) – Financing through WSRF Grant and Water Project Loan

Given the entities involved, it is not expected that significant permitting will be required to undertake construction of the project. Redlands Water and Power is aware that design review and acceptance with the CWCB is required prior to bidding and construction.

Redlands Water and Power Company has already entered into a design contract with J-U-B Engineers for final plans, specifications, and contract documents. Upon completion of the design and acceptance of the design by CWCB, RWPC will be the lead during the bid process, material acquisition and construction of the project with assistance from J-U-B as required.

RWPC will be the entity entering into contracts and agreements with contractors, vendors, and other construction phase services. Some construction phase permitting may be required and will be the responsibility of the contractor.

Financial Feasibility

To finance the estimated $860,000 project, RWPC is contributing $100,000 in cash, and then utilizing a combination of grants and loans, all from CWCB. Cash contributions will be withdrawn from the RWPC investment account for construction of this project (See Appendix F for account balances as of the preparation of this report). RWPC has recently secured grant funding from the WSRF Gunnison Basin account for $50,000, with an

additional $75,000 from the WSRF Statewide account. The WSRF grant requires varying levels of an applicant match, which RWPC will exceed through the funds acquired through the requested CWCB Water Project Loan program. The estimated funding distribution by source is provided in Table 5. Please note that any additional costs incurred will be funded by RWPC.

Table 5. Funding Distribution by Source

Entity	Grant	Loan/ Cash	Total	Percent Participation
CWCB	$ 125,000	$ 635,000	$ 760,000	88%
RWPC	$ -	$ 100,000.00	$ 100,000.00	12%
Totals	**$ 125,000**	**$ 735,000**	**$ 860,000**	**100%**

Redlands Water and Power Company is requesting a 10-year loan from the CWCB. Given the demographics and that approximately 28% of the service area is agricultural use, RWPC believes that it should receive a blended rate between the "Middle Income Municipal" rate and the "Agricultural" rate. For a 10-year term, a rate reduction is also anticipated. To be conservative a rate of 1.55% is assumed for analysis, resulting in an annual loan service amount of $69,038. RWPC anticipates that no loan fund reserve will be required given the short duration of this loan.

RWPC recently increased assessments to $195 per share with 5 shares owned within the company, accounting for an estimated $1,123,005 in assessments. It is likely that within the next five years, assessments will be increased to $200 per share. Selling electric power, reimbursement for fish screen/ladder operation, and a portfolio of other investments and income streams amounts to another $317,000 annually, which is likely to increase over the loan term. Current annual revenue for analysis is estimated at $1,440,005.

Annual operating expenses for 2016-2018 are provided in Table 6, while full financial statements for the three years are provided in Appendix E. Based on provisional 2019 data, annual operating expenses, excluding a project loan, are estimated at $1,307,000. A schedule of Revenue and Expenditures is provided in Table 7.

Table 6. 2016-2018 Annual Operating Expenses

	Operating Expense
2016	$ 1,238,984.00
2017	$ 1,180,474.00
2018	$ 1,218,534.00

Table 7. Schedule of Revenue and Expenditures

Total Project Cost	$ 860,000
O&M	$ 425,000.00
Insurance	$ 135,000.00
Replacements	$ 110,000.00
Administration and Wages	$ 637,000.00
Total	$ 1,307,000.00
Number of Shares in Company	5759
Other Revenue	$ 317,000
Inflation	1%
Interest on Reserves	3%

Financing					
Source	Share	Principal	Interest	Years	Payment
CWCB	100%	$ 635,000	1.55%	10	$69,038
Others	0%	N/A	N/A	N/A	$0.00

	Annual Revenue				Annual Payments						
Year of Operation	Irrigation Assessments	Other Revenue	Total Revenue	Assessment Per Share	Operation, Maintenance, Replacement	CWCB Loan Reserve Fund Annual	CWCB Loan Reserve Fund Accum.	Payments on CWCB Loan	Payments on Other Loans	Interest on Reserves	Total Expenditures
1	$ 1,123,005	$ 317,000	$ 1,440,005	$ 195	$ 1,307,000	$ -	$0	$69,038	$ -	$0	$ 1,376,038
2	$ 1,123,005	$ 317,000	$ 1,440,005	$ 195	$ 1,320,070	$ -	$0	$69,038	$ -	$0	$ 1,389,108
3	$ 1,123,005	$ 317,000	$ 1,440,005	$ 195	$ 1,333,271	$ -	$0	$69,038	$ -	$0	$ 1,402,309
4	$ 1,123,005	$ 317,000	$ 1,440,005	$ 195	$ 1,346,603	$ -	$0	$69,038	$ -	$0	$ 1,415,642
5	$ 1,123,005	$ 317,000	$ 1,440,005	$ 195	$ 1,360,069	$ -	$0	$69,038	$ -	$0	$ 1,429,108
6	$ 1,151,800	$ 317,000	$ 1,468,800	$ 200	$ 1,373,670	$ -	$0	$69,038	$ -	$0	$ 1,442,708
7	$ 1,151,800	$ 317,000	$ 1,468,800	$ 200	$ 1,387,407	$ -	$0	$69,038	$ -	$0	$ 1,456,445
8	$ 1,151,800	$ 317,000	$ 1,468,800	$ 200	$ 1,401,281	$ -	$0	$69,038	$ -	$0	$ 1,470,319
9	$ 1,151,800	$ 317,000	$ 1,468,800	$ 200	$ 1,415,294	$ -	$0	$69,038	$ -	$0	$ 1,484,332
10	$ 1,151,800	$ 317,000	$ 1,468,800	$ 200	$ 1,429,447	$ -	$0	$69,038	$ -	$0	$ 1,498,485
Totals	$ 11,374,025	$3,170,000	$ 14,544,025		$ 13,674,112	$0		$690,382	$ -	$0	$ 14,364,494

Tabor Issues:

As a private, non-profit organization, no Tabor issues are expected to arise from the funding of this project.

Loan Collateral:

Redlands Water and Power has significant real property that can exceed 110% of the loan value if needed. The Mesa County assessor values the RWPC Main Office Building at 2216 S. Broadway, Grand Junction, CO 81507 at a value of $594,870. An additional 150 acres in undeveloped property is owned by RWPC near the Gunnison River on route to the RWPC Diversion Structure (Parcel Number 2945-274-00-050). This land is valued at $800,000.

RWPC believes that its real property value exceeds the amount needed for loan collateral.

Conclusions and Recommendations:

- The Pumpline Replacement Project is needed to provide water delivery security to the shareholders and water users of Redlands Water and Power.
- Redlands Water and Power Company is incorporated in the State of Colorado and can enter into a contract with the CWCB for the purposes of obtaining a loan.
- The project extents are entirely within RWPC property with no easements anticipated for construction. No permitting issues are expected.
- The total estimated cost of the project is $860,000. Financing will be provided by combining $125,000 in secured CWCB WSRF grants, $100,000 in RWPC cash, and a $635,000 loan.
    - RWPC Cash will come from their investment account with information provided in Appendix F
- The project is technically and financially feasible

Appendix A

Project and Service Area Maps

Redlands Water & Power Company Service Area

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- Bluegrass - 72% of Irrigated Acres
- Pasture Grass - 26% of Irrigated Acres
- Orchard - 1% of Irrigated Acres
- Vinyard - 1% of Irrigated Acres
- City of Grand Junction

Colorado River

Gunnison River

0 0.5 1 2

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Redlands Water & Power Company
Pumpline Replacement
Project Location Map

Redlands, Colorado

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Redlands
Grand Junction
Colorado River
Redlands Power Canal
Gunnison River
Hydroelectric Facilty
Pump Station #1
Proposed Pumpline Replacement
Replaced in 2007
First Lift Ditch
Diversion
0 300 600 Feet
0 1,000 2,000 Feet

Appendix B

Water Rights Summary

Average Monthly Diversion Table

	Redlands Power Canal Diversion (WDID = 4200541) Monthly Average Flow Rates (cfs)												
	January	February	March	April	May	June	July	August	September	October	November	December	**Annual Average**
1975	582.58	678.57	519.35	484.23	496.95	502.40	479.62	454.95	485.44	478.18	700.00	700.00	**546.86**
1976	681.94	695.17	699.03	486.81	499.68	504.06	468.22	469.20	486.87	473.10	656.15	693.23	**567.79**
1977	640.65	700.00	611.61	410.77	436.76	392.38	368.34	381.67	442.94	452.57	683.33	683.55	**517.05**
1978	684.19	700.00	700.00	627.25	466.53	493.52	484.46	470.61	493.15	486.42	695.71	639.03	**578.41**
1979	595.81	676.07	700.00	548.74	495.77	505.12	406.95	468.43	502.33	506.15	603.67	654.84	**555.32**
1980	677.42	700.00	669.57	533.07	498.07	503.87	434.49	468.51	490.20	477.44	700.00	700.00	**571.05**
1981	700.00	700.00	696.77	488.99	497.18	478.55	478.89	474.47	498.20	500.29	700.00	698.06	**575.95**
1982	619.68	692.86	700.00	524.57	497.28	505.73	496.22	497.86	495.13	475.72			**550.50**
1983				40.50	50.27	458.73	506.63	490.80	504.71	517.04	700.00	700.00	**440.96**
1984	631.43	700.00	700.00	675.86	700.00	700.00	684.52	488.18	700.00	700.00	670.74	700.00	**670.89**
1985	700.00	697.14	700.00	665.00	700.00	694.00	692.26	697.10	700.00	676.67	688.00	700.00	**692.51**
1986	700.00	700.00	674.48	700.00	700.00	700.00	700.00	700.00	700.00	676.67	632.33	719.23	**691.89**
1987	727.52	735.75	663.61	729.87	741.26	777.57	800.61	797.06	790.53	688.16	661.33	736.94	**737.52**
1988	734.45	738.17	625.29	767.17	795.29	788.13	717.90	765.61	784.80	785.77	65.23	425.61	**666.12**
1989	748.13	755.18	785.84	708.07	830.00	831.03	700.65	797.71	804.37	779.00	759.90	743.03	**770.24**
1990	720.03	652.32	657.61	727.90	801.68	789.73	771.48	732.55	751.23	813.77	671.47	728.68	**734.87**
1991	373.61	778.89	799.13	716.20	798.71	793.23	787.87	735.00	766.83	738.45	661.63	737.06	**723.89**
1992	728.77	738.66	639.13	732.50	730.48	739.07	747.52	748.48	745.87	680.06	598.60	735.39	**713.71**
1993	751.97	760.82	724.52	670.33	718.16	726.60	731.19	738.55	735.40	745.16	645.73	742.48	**724.24**
1994	743.26	724.00	739.32	657.23	747.52	745.93	738.16	742.94	747.23	586.58	613.93	752.06	**711.51**
1995	773.19	768.96	749.74	601.90	780.29	789.73	779.23	764.03	784.93	748.26	598.80	834.77	**747.82**
1996	832.35	838.07	807.03	680.20	840.77	834.67	811.52	778.55	795.13	606.77	827.27	802.52	**787.90**
1997	760.19	802.00	768.71	588.63	832.55	830.30	803.23	823.97	805.27	617.16			**763.20**
1998											807.53	779.16	**793.35**

	Redlands Power Canal Diversion (WDID = 4200541) Monthly Average Flow Rates (cfs)												
	January	February	March	April	May	June	July	August	September	October	November	December	**Annual Average**
1999	749.0	748.5	687.8	727.1	852.6	851.1	826.8	826.0	828.8	463.5	811.8	825.4	**766.5**
2000	759.9	728.4	634.9	788.5	801.6	790.2	772.2	792.3	796.2	715.6	781.8	760.6	**760.2**
2001	736.3	736.1	705.4	793.4	818.7	799.0	756.4	800.7	807.4	725.1	529.1	761.4	**747.4**
2002	747.4	746.8	741.1	690.7	718.0	619.4	626.2	659.1	737.2	764.8	10.5	0.0	**588.4**
2003	0.0	0.0	144.1	716.5	822.4	802.6	739.7	748.7	753.9	299.1	0.0	310.5	**444.8**
2004	611.2	632.9	636.1	827.5	838.5	826.9	762.8	766.4	772.3	477.5	0.0	0.0	**596.0**
2005	0.0	0.0	0.0	782.2	821.0	827.1	814.3	818.0	821.3	523.2	807.8	799.3	**584.5**
2006	789.5	779.6	677.9	768.6	785.1	823.2	825.1	819.2	817.1	580.1	808.1	810.8	**773.7**
2007	774.8	812.0	801.2	640.9	824.8	839.8	831.0	828.3	839.8	752.5	810.2	817.1	**797.7**
2008	711.6	797.7	638.1	801.5	805.0	817.6	788.4	809.2	824.8	796.3	667.8	764.6	**768.5**
2009	86.4	343.3	791.0	733.4	793.8	823.9	824.6	825.0	814.8	828.0	766.8	815.5	**703.9**
2010	758.7	776.5	774.3	874.9	922.6	944.1	908.1	934.0	917.9	923.8	785.6	601.8	**843.5**
2011	783.8	735.3	747.2	876.2	900.8	938.5	927.9	930.8	936.6	904.2	352.1	830.7	**822.0**
2012	849.5	830.8	429.9	860.4	833.4	823.6	854.0	876.2	882.9	854.5	134.8	390.7	**718.4**
2013	79.8	65.6	609.6	729.6	824.4	795.6	787.0	813.7	799.0	807.8	520.2	746.1	**631.5**
2014	712.5	736.6	683.8	818.8	855.1	873.7	891.2	875.2	878.2	388.2	782.2	811.4	**775.6**
2015	787.4	790.9	571.7	812.0	853.5	864.1	856.2	853.4	853.8	668.5	488.1	790.1	**765.8**
2016	731.9	805.9	576.0	830.5	858.0	865.6	872.8	866.0	863.4	652.0	707.5	795.5	**785.4**
2017	785.3	807.5	672.6	828.1	858.2	851.2	801.9	874.7	874.8	788.8	743.2	816.6	**808.6**
2018	813.5	767.6	655.7	768.6	845.5	819.1	795.7	786.9	799.1	800.8	649.6	737.5	**770.0**
2019	633.0	782.1	680.6	840.8	854.9	865.0	886.4	885.1	862.8	688.3			**797.9**
Monthly Average	**651.4**	**682.7**	**655.6**	**688.1**	**730.5**	**739.7**	**721.3**	**724.4**	**738.5**	**650.3**	**607.1**	**685.5**	**690.8**

Appendix C

Articles of Incorporation

REDLANDS WATER & POWER COMPANY
2216 SOUTH BROADWAY
GRAND JUNCTION, COLORADO 81503

ARTICLES OF INCORPORATION

STATE OF COLORADO

DEPARTMENT OF STATE

CERTIFICATE

I, NATALIE MEYER, Secretary of State of the State of Colorado hereby certify that the prerequisites for the issuance of this certificate have been fulfilled in compliance with law and are found to conform to law.

Accordingly, the undersigned, by virtue of the authority vested in me by law, hereby issues A RESTATED CERTIFICATE OF INCORPORATION WITH AMENDMENTS TO REDLANDS WATER AND POWER COMPANY, A NONPROFIT CORPORATION.

Dated: FEBRUARY 19, 1992

Natalie Meyer

SECRETARY OF STATE

RESOLUTION TO RESTATE THE ARTICLES OF INCORPORATION

At a regular meeting of the Board of Directors of Redlands Water and Power Company duly held on DECEMBER 11, 1991, the following Resolution was proposed and unanimously adopted.

BE IT RESOLVED THAT the Articles of Incorporation of the company be restated to read as follows:

(See attached Exhibit A)

IT IS FURTHER RESOLVED THAT the Restated Articles of Incorporation be submitted to a vote of the shareholders of the corporation as provided in the Articles of Incorporation and Bylaws at the annual meeting of the shareholders to be held on JANUARY 14, 1992.

IN WITNESS WHEREOF I have signed this Resolution as Secretary of the corporation upon its adoption at a regular meeting of the Board of Directors of Redlands Water & Power Company duly held on the above date, and I have caused the corporate seal of the corporation to be affixed hereto.

E Gale Loesch
Secretary E. GALE LOESCH

(SEAL)

APPROVED:

Robert L. Sutton
ROBERT L. SUTTON

William T. Cohan
WILLIAM T. COHAN

Duane Clymer
DUANE CLYMER

Ronald P. Bonds
RONALD P. BONDS

E Gale Loesch
E. GALE LOESCH

Leatha Jean Stassen
LEATHA JEAN STASSEN

Gary Boesch
DIRECTORS GARY BOESCH

Restated Articles of Incorporation
of
Redlands Water and Power Company
(a Nonprofit Corporation)

ARTICLE I
NAME

The name of the corporation is
REDLANDS WATER AND POWER COMPANY.

ARTICLE II
STATE OF ORGANIZATION

The corporation is organized under the laws of the State of Colorado, and it has elected the provisions of the Colorado Nonprofit Corporation Act.

ARTICLE III
DURATION

The period of duration of the corporation shall be perpetual.

ARTICLE IV
PURPOSES AND POWERS

The objects, purposes and powers for which said company shall be created are: To purchase, acquire, own and possess the rights of way, canals, ditches, pipe lines, laterals, water rights, appropriations, priorities, decreed rights, power plants, substations, transmission lines and other property of The Redlands Water and Power Company; to maintain, operate, manage and control the same, to add to, extend and complete the system of works so acquired; to furnish and distribute to the stockholders water for irrigation and domestic purposes; to use power developed in its said system for the above purposes and to sell any surplus of power so developed from time to time; to borrow money; to mortgage, pledge or hypothecate any of the property of the corporation for company purposes; to bargain, sell, exchange, transfer, convey, warrant and covenant concerning, any of its property and rights or any interest in any thereof; to assume and perform any of the obligations of The Redlands Water and Power Company in favor of individual owners of any outstanding contracts for water right issued from said Redlands Water and Power Company; and to have and exercise any and every other powers and rights which may be incident or beneficial to the exercise and attainment of any of the above stated objects, purposes and powers.

This corporation shall not be or function as a common carrier of water or power, nor make any contracts on its own behalf to sell, rent or carry water or power for hire, or sell or rent or carry water or power for hire, except to sell and dispose of from time to time such surplus power as may be from time to time developed by its plant beyond its own need, - the same being purely the sale of dump power.

ARTICLE V
SOURCE AND PARTICULARS OF THE WATER

The stream from which the water for the canals or ditches of this corporation shall be taken is the Gunnison River.

The point or place on said stream near which the water is to be taken out is located on the left bank of the Gunnison River, in the Southeast quarter of the Northwest quarter (SE1/4 NW1/4) of Section thirty-five (35), Township one (1) South, Range one (1) West of the Ute Principal Meridian, in Mesa County, Colorado.

The canal flows in a northwesterly direction parallel to the Gunnison River to its junction with the Colorado, and then paralleling the Colorado River to a point about 3 1/2 miles below the point of diversion, where the water is taken through a hydroelectric and pumping plant, which is located in the northeast quarter of the southeast quarter (NE 1/4 SE 1/4) of Section sixteen (16), Township one (1) South, Range one (1) West of the Ute Principal Meridian. There are approximately 300 acres of land under irrigation under the power canal.

The water in the power canal is pumped to a height of 127 1/2 feet, through a pipe line approximately 1600 feet to the intake of First Lift and Stub Ditch. Approximately 33 acres are watered under the pipe line by direct use therefrom, herein classified as from a lift ditch.

The First Lift Ditch flows in a northwesterly direction from its said intake about 11 miles, and waters approximately 2250 acres of land.

The Stub Ditch also takes water out of the same discharge of the pipe line, and is a lift ditch. It runs for a distance of 2 miles, in a southeasterly direction, and waters approximately 160 acres of land.

At a point about 3.8 miles on the First Lift Canal, below its intake, is located a substation that lifts the water 78 feet and carries it through a canal about 6 miles long, in a northwesterly direction, watering approximately 1025 acres.

At the beginning of the Second Lift is another substation which lifts the water 50 feet and carries it a distance of 1 1/2 miles in a southwesterly direction, irrigating approximately 100 acres.

At a point on the Second Lift, approximately 3 miles below its intake, is located another Third Lift substation, which lifts the water 50 1/2 feet and carries the water through a canal approximately 3 miles, in a northwesterly direction, watering approximately 350 acres of land.

All of the above substations are operated by electric driven pumps, the current for which is generated from the hydroelectric plant located on the power canal.

It is intended that our said corporation shall be empowered to extend any of the said canals beyond their lower termini to serve any additional acreage of available land; also to construct any additional lift canals above the levels of said existing lift canals to be connected with power lift plants and pipe line thereby to serve any available additional land, all and each as may be found feasible and expedient.

The water from said ditches, canals and works is to be used for irrigation, domestic and power purposes.

ARTICLE VI
CAPITAL STOCK

Section 1. Authorized Shares. The aggregate number of shares, which the Corporation shall have authority to issue is 6,000 shares, consisting of:

a. 4,600 shares, which shall be either Class A or Class B, Lift Canal Stock, without par value; and

b. 400 shares, which shall be either Class C or Class D, Power Canal Stock, without par value; and

c. 1,000 shares, which shall be either Class E or Class F, Lift Canal Stock, without par value, the nature and character of which shall be as set forth in the corporate by-laws.

Section 2. Classes A and B.

a. Every user of water under the Lift Canal System shall be required to own at least one share of Class A, Lift Canal Stock, as a prerequisite to obtaining water through the facilities of the Company. Any shares of Class A stock in excess of one share owned by any individual, individuals, or entity may be converted into Class B stock upon the request of such owner.

b. Shareholders owning in excess of one (1) share of Lift Canal Stock are entitled to receive such excess in Class B stock. In the event of the transfer or sale of any share or shares of Class B stock, such transfer shall be deemed an election on the part of the transferor and transferee to convert such share, or the first share, if more than one share is being transferred, of such Class B stock so transferred, to Class A stock; Provided, however, that if such transferee owns any share or shares of Class A stock at the time of such transfer or sale, then in that event such transfer or sale shall not be deemed an election to convert such share, or the first share, as above described, to Class A. In the event any owner of both Class A and Class B stock attempts to convey, transfer or sell all of the Class A stock so owned, retaining only Class B stock, such conveyance, transfer or sale shall be deemed null and void and of no force or effect as to one share of such Class A stock concerned.

c. Each share of Class A or Class B stock shall entitle the owner thereof to receive 1/3 statute inch of water, or a pro-rata share of the water in the Lift Canal System.

d. Classes A and B, Lift Canal Stock shall be issued for the use of water under the Lift Canal System above described and under any extension thereof and additions thereto and shall not be transferred for use under the Power Canal System.

Section 3. Classes C and D.

a. Every user of water under the Power Canal System shall be required to own at least one share of Class C, Power Canal Stock, as a prerequisite to obtaining water through the facilities of the Company. Any shares of Class C stock in excess of one share owned by any individual, individuals, or entity may be converted into Class D stock upon the request of such owner.

b. Shareholders owning in excess of one (1) share of Power Canal Stock are entitled to receive such excess in Class D stock. In the event of the transfer or sale of any share or shares of Class D Stock, such transfer shall be deemed an election on the part of the transferor and transferee to convert such share, or the first share, if more than one share is being transferred, of such Class D stock; provided, however, that if such transferee owns any share or shares of Class C stock at the time of such transfer or sale, then in that event such transfer or sale shall not be deemed an election to convert such

share, or the first share, as above described, to Class C. In the event any owner of both Class C and Class D stock attempts to convey, transfer or sell all of the Class C stock so owned, retaining only Class D stock, such conveyance, transfer or sale shall be deemed null and void and of no force or effect as to one share of such Class C stock concerned.

c. Each share of Class C or Class D stock shall entitle the owner thereof to receive 1/2 statute inch of water, or a pro-rata share of the water in the Power Canal System.

d. Classes C and D, Power Canal Stock shall be issued for the use of water under the Power Canal System above described and under any extension thereof and additions thereto and shall not be transferred for use under the Lift Canal System.

Section 4. Assessment of Stock.

a. The capital stock of the Company shall be assessed when necessary to raise funds to keep its ditches, canals, plants, reservoirs, and any and all other facilities in good repair, or when it is necessary to raise funds to pay any indebtedness theretofore contracted or the interest thereon. Such assessment shall be payable in money or labor or both, provided, however, that whether or not labor shall be accepted in lieu of money shall be at the sole discretion of the Board of Directors. No assessment shall be made unless the question of making such assessment shall first be submitted to the stockholders of such Corporation, at an annual meeting, or at a special meeting called for that purpose and a majority of a quorum of the stock entitled to vote, represented either by the owner in person or by proxy, voting thereon, shall be voted in favor of making such assessment; that a quorum for the purposes hereof shall be not less than one-third of the issued and outstanding capital stock of the Company; provided, however, that in the case said stockholders fail to hold any such meeting or fail to make or authorize any such assessment by the 1st day in April in any year, then the Directors of the Company shall have power to make any such assessment at any regular or special Directors' Meeting called therefor for such year.

b. Manner of Assessing. - Assessments shall be levied pro-rata on the shares of each Class of stock as follows:

1. The assessment per share of Class B stock shall be set first. All Classes of stock shall be entitled to vote on such assessment.

2. The assessment per share of Class D stock shall be 1/2 the assessment set for Class B stock.

3. The assessment per share of Class A stock shall then be set. All classes of stock shall be entitled to vote on such assessment. The assessment per share shall be set at not less than double nor more than four times the amount of the assessment per share of Class B stock.

4. The assessment per share of Class C stock shall be 1/2 the assessment set for Class A stock.

c. Forfeiture. - The Directors of the Company by By-Laws may prescribe for a forfeiture or sale of stock on failure to pay such assessments as the same become due from time to time, but no forfeiture of stock shall be declared against any estate or against any stockholder before demand shall have been made for the amount due thereon, either in person or by written or printed matter, duly mailed, to the last known address of such stockholder, at least 30 days prior to the time when such forfeiture is to take effect; but the proceeds of any sale, over and above the amount due on such shares, shall be paid to the delinquent stockholder. The Company shall have a perpetual lien upon all shares of the Company stock and the water rights represented by the same, for any and all such assessments and all parts thereof until the same are fully paid. The Company shall not be required to deliver water to any stockholder until all assessments owed by such stockholder shall have first been paid.

ARTICLE VII
NO PRE-EMPTIVE RIGHTS

No holder of shares of capital stock shall have any pre-emptive or other rights as such holder to purchase, subscribe for, or otherwise acquire any part of any new or additional shares of stock of any class whatsoever, or of securities convertible into any class whatsoever, or of warrants, rights, or other instruments which carry the right to purchase shares of stock of any class whatsoever, whether now or hereafter authorized, or whether issued for cash, property or services.

ARTICLE VIII
VOTING - WHEN CUMMULATIVE VOTING ALLOWED

Section 1. General Matters.

The voting power shall vest solely in the holders of the capital stock. At every meeting of the stockholders every holder of capital stock, whether it be Class A, B, C or D shall be entitled to one vote for each share standing in his name on the books of the Corporation.

Section 2. Election of Directors.

Every holder of the capital stock shall have the right to vote in person or by proxy, the number of shares owned by him for as many persons as there are Directors to be elected and for whose election he has a right to vote, or to cumulate his votes by giving one candidate as many votes as the number of such Directors multiplied by the number of his shares shall equal, or by distributing such votes on the same principle among any number of such candidates.

ARTICLE IX
BOARD OF DIRECTORS

The corporation shall have a Board of Directors consisting of seven persons.

ARTICLE X
PRINCIPAL OFFICE

The principal office of the corporation shall be at Grand Junction, Mesa County, Colorado, and the principal business of the company shall be carried on in the County of Mesa and State of Colorado.

ARTICLE XI
BY-LAWS

The Board of Directors shall have the power to make such prudent by-laws as they may deem proper for the management of the affairs of the company, not inconsistent with these Articles of Incorporation nor inconsistent with laws. The by-laws may provide that no person shall be eligible to or remain in office as a director who shall not be a resident of Mesa County, Colorado; and may provide further qualification severally for the office of one or more directors, so as to insure there being one or more directors from among owners of any kind of stock irrigating lands by waters thereon in any particular area or areas, respectively, as may be defined by the by-laws.

ARTICLE XII
RESTATED ARTICLES

These Restated Articles of Incorporation only restate and integrate and do not further amend the provisions of the corporation's Articles of Incorporation as previously amended or supplemented. There is no discrepancy between such Articles of Incorporation with such amendments or supplements and the provisions of the Restated Articles of Incorporation. The Restated Articles of Incorporation supercede the original Articles of Incorporation and all amendments and supplements thereto. Omitted from the Restated Articles of Incorporation are the provisions of the original Articles of Incorporation which named the incorporators and the initial board of directors of the corporation.

The above and foregoing Restated Articles of Incorporation were duly adopted on January 14, 1992, at an annual meeting of the shareholders of the Corporation entitled to vote thereon with a quorum present, upon the affirmative vote of the majority of such shareholders entitled to vote thereon who were present at such meeting or represented by proxy.

Dated this 12th day of February, 1992.

Redlands Water and Power Company

By Robert L. Sutton
President

Attest:

John B. Custer
Secretary

VERIFICATION

STATE OF COLORADO,)
) ss.
COUNTY OF M E S A.)

Robert L. Sutton, being first duly sworn upon his oath, deposes and says:

He is president of Redlands Water and Power Company. He has read the foregoing Restated Articles of Incorporation, knows the contents thereof, and they accurately reflect the Articles of Incorporation as originally adopted and later amended.

Further your affiant sayeth not.

Redlands Water and Power Company

Robert L. Sutton
President

Subscribed and sworn to before me this 12th day of February, 1992, by Robert L.Sutton, as President of Redlands Water and Power Company.
Witness my hand and official seal.
My commission expires: May 22, 1993

Richard A. Arnold
Notary Public

FILED COPY

NONPROFIT

951005715 $25.00
SECRETARY OF STATE
01-17-95 11:29

ARTICLES OF AMENDMENT
OF
REDLANDS WATER AND POWER COMPANY

Redlands Water and Power Company, a Colorado nonprofit corporation, having its principal office at 197 Power Road, Grand Junction, Colorado 81503 (Corporation), hereby certifies to the Secretary of State that:

FIRST: The name of the corporation is: Redlands Water and Power Company

SECOND: The Articles of Incorporation of the Company are hereby amended by striking Article VI, Section 4(b), and by substituting in lieu thereof the following:

> Manner of Assessment. Assessments shall be levied on all shares of stock of the Corporation in an equal amount, on a pro rata basis, regardless of class.

THIRD: The amendment was recommended to the stockholders by resolution of the Board of Directors, which was adopted at a regular meeting of the Board of Directors held on December 14, 1994.

FOURTH: The amendment was adopted by the stockholders of the Corporation in the manner prescribed by the Colorado Nonprofit Corporation Act at the annual meeting held January 10, 1995, at which a quorum of members was present, and the amendment received at least two-thirds of the votes which stockholders present at such meeting or represented by proxy were entitled to cast.

IN WITNESS WHEREOF, Redlands Water and Power Company have caused these Articles of Amendment to be signed in its name and on its behalf by its President and its corporate seal to be hereunder affixed and attested to by its Secretary on this 12th day of January, 1995, and its President acknowledges that these Articles of Amendment are the act and deed of Redlands Water and Power Company and, under penalties of perjury, that the matters and facts set forth herein with respect to authorization and approval are true in all material respects to the best of the President's knowledge, information and belief.

REDLANDS WATER AND POWER COMPANY

By Earl Fisk
Earl Fisk, President

Attest:

Edward A. Carpenter
Edward Carpenter, Secretary

ARTICLES OF AMENDMENT
OF
REDLANDS WATER AND POWER COMPANY

The Amended and Restated Articles of Incorporation of Redlands Water and Power Company, a Colorado nonprofit corporation, dated January 12, 1995, as previously amended, are hereby amended as provided in these Articles of Amendment.

1. Article VI, Section 1, is amended to provide as follows:

Section 1. Authorized Shares. The aggregate number of shares, which the Corporation shall have the authority to issue, is 6,000 shares, consisting of:

a. Five thousand six hundred (5,600) shares of Lift Canal Stock, without par value; and

b. Four hundred (400) shares of Power Canal Stock, without par value.

2. Article VI, Section 2, is amended to provide as follows:

Section 2. Lift Canal Stock.

a. Each share of Lift Canal Stock shall entitle the owner thereof to receive one-third (1/3) statute inch of water, or a pro rata share of the water in the Lift Canal System.

b. Lift Canal Stock shall be issued for the use of water under the Lift Canal System above described and under any extension thereof and additions thereto and shall not be transferred for use under the Power Canal System. Transfer of Lift Canal Stock between different lifts shall be subject to conditions and restrictions set forth in the bylaws.

c. All Lift Canal Stock currently designated as A, B, E and F shares shall be deemed to be Lift Canal Stock without the need for reissuance of stock certificates. However, upon future reissuance of stock certificates, such certificates shall be reissued as Lift Canal Stock with a designation as to the lift where the water represented by the stock is used.

3. Article VI, Section 3, is amended to provide as follows:

Section 3. Power Canal Stock.

a. Each share of Power Canal Stock shall entitle the owner thereof to receive one-half (½) statute inch of water, or a pro rata share of water available for irrigation in the Power Canal System.

b. Power Canal Stock shall be issued for use of water under the Power Canal System above described and under any extension thereof and any additions thereto and shall not be transferred for use under the Lift Canal System.

c. All Power Canal Stock currently designated as C or D shares shall be deemed to be Power Canal Stock without the need for reissuance of certificates. However, upon future reissuance of stock certificates, such certificates shall be reissued as Power Canal Stock.

4. Article VIII, Section 1, is amended to provide as follows:

Section 1. General Matters. The voting power shall vest solely in the holders of the capital stock. At every meeting of the stockholders, every holder of capital stock, whether it be Power Canal Stock or Lift Canal Stock, shall be entitled to one (1) vote for each share standing in such stockholder's name on the books of the Corporation.

REDLANDS WATER AND POWER COMPAN

By Charles A. Mitisek
Chuck Mitisek, President

By Earl Fisk
Earl Fisk, Secretary/Treasurer

Appendix D

90% Design Drawings

REDLANDS WATER AND POWER

PUMPLINE REPLACEMENT PROJECT

January 2020

PRELIMINARY PLANS NOT FOR CONSTRUCTION

Sheet List Table	
SHEET NUMBER	SHEET TITLE
GENERAL	
G–001	COVER
G–002	GENERAL NOTES & VICINITY MAP
G–003	LINE LEGEND & DETAIL KEY
G–004	SYMBOL LEGEND & ABBREVIATIONS
SURVEY	
V–101	SURVEY CONTROL
CIVIL: PLAN	
C–101	SHEET KEY & OVERALL LAYOUT
CIVIL: PLAN & PROFILES	
C–201	PLAN & PROFILE
C–202	PLAN & PROFILE
CIVIL: DETAILS	
C–501	CIVIL DETAILS SHEET 1 OF 5
C–502	CIVIL DETAILS SHEET 2 OF 5
C–503	CIVIL DETAILS SHEET 3 OF 5
C–504	CIVIL DETAILS SHEET 4 OF 5
C–505	CIVIL DETAILS SHEET 5 OF 5
STRUCTURAL	
S–001	GENERAL STRUCTURAL NOTES
S–002	GENERAL STRUCTURAL NOTES
S–101	WATERLINE CANAL CROSSING PLAN
S–501	TYPICAL WATERLINE CANAL CROSSING SUPPORT DETAILS
S–502	TYPICAL CANAL CROSSING WALKWAY AND RAILING DETAILS
S–503	TYPICAL GALVANIZED STEEL GRATING DETAILS
S–504	TYPICAL CONCRETE DETAILS

PROJECT NO. 81-19-015

J-U-B ENGINEERS, INC.

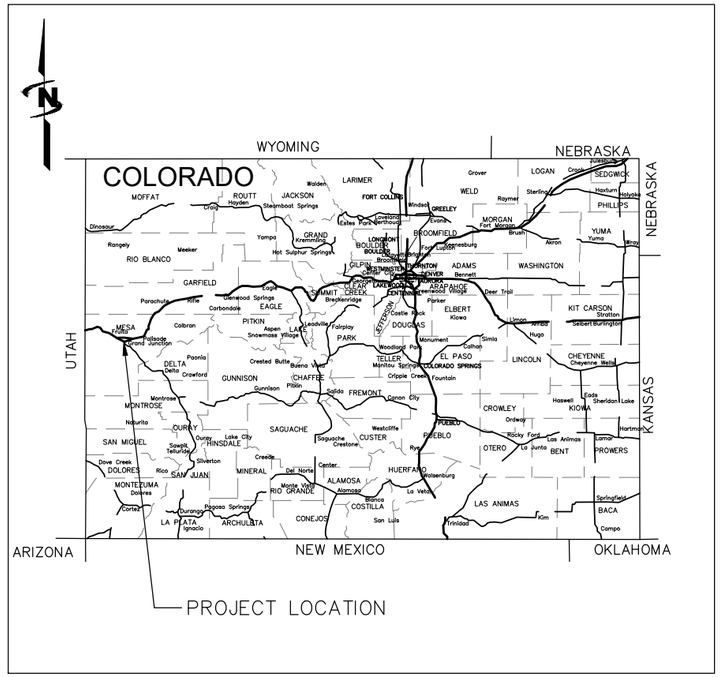
305 Main Street, Palisade, CO 81526
p 970 208 8508 *w* www.jub.com

OTHER J-U-B COMPANIES THE LANGDON GROUP GATEWAY MAPPING INC.

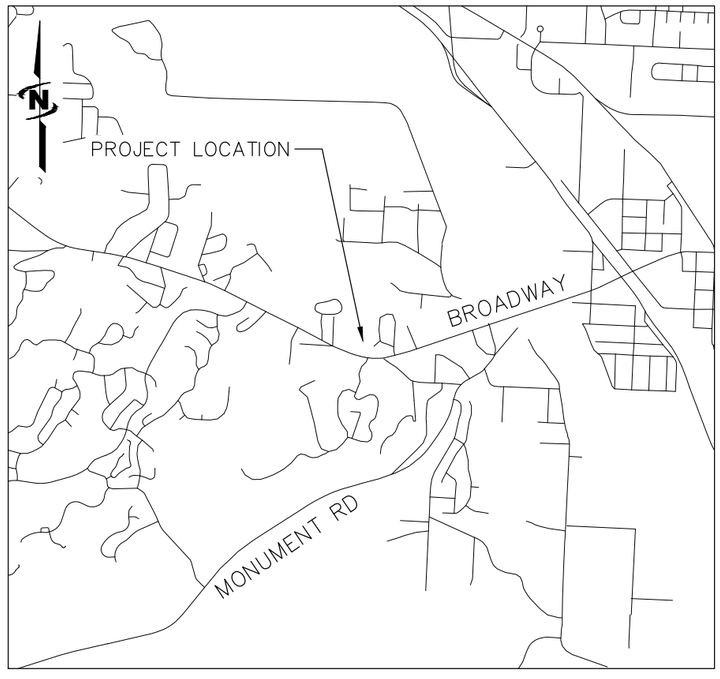
LAST UPDATED: 1/15/2020

SHEET NUMBER:

G-001



AREA MAP



VICINITY MAP

GENERAL NOTES

1. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND BUSINESS LICENSES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS RESPONSIBLE FOR DUST ABATEMENT AND ANY LIABILITY ISSUES RELATED TO DUST AT ANY LOCATION WHICH MAY BE CAUSED BY THIS PROJECT.
3. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL AND PROTECTION OF PEDESTRIANS IN AND AROUND THIS WORK. REFERENCE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD LATEST EDITION FOR WORK ZONE TRAFFIC CONTROL).
4. ANY WORK DONE WITHIN A PUBLIC RIGHT-OF-WAY SHALL BE COORDINATED WITH THE APPROPRIATE TRANSPORTATION AGENCY AND SHALL MEET THE REQUIREMENTS OF THAT AGENCY AND, IN PARTICULAR, REQUIREMENTS OF ANY RIGHT-OF-WAY SPECIAL USE PERMIT, OR OTHER PERMIT. ALL WORK SHALL MEET CURRENT OSHA REQUIREMENTS.
5. WHERE WORK IS PERFORMED ON EASEMENTS, THE CONTRACTOR SHALL TAKE EVERY PRECAUTION TO ELIMINATE ANY ADVERSE EFFECTS ON THE ADJACENT PROPERTY AND/OR TO RESTORE TO ITS ORIGINAL OR BETTER CONDITION. CONTRACTOR SHALL ALSO COMPLY WITH EASEMENT AGREEMENTS.
6. ALL DISTANCES AND DATA SHALL BE CHECKED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. IN CASE OF CONFLICT THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY SO THAT CLARIFICATION MAY BE MADE PRIOR TO THE START OF THE WORK.
7. THE CONTRACTOR SHALL ARRANGE FOR, SECURE AND PAY FOR DIRECTLY, ANY AND ALL TEMPORARY UTILITY SUPPLIES (E.G. WATER POWER, AND TELEPHONE) IT MAY REQUIRE FOR PROSECUTION OF ITS WORK. THE COST OF SUCH UTILITIES SHALL BE INCLUDED IN THE APPROPRIATE BID ITEM WITH WHICH IT IS ASSOCIATED.
8. SHOULD CONSTRUCTION BE HALTED BECAUSE OF INCLEMENT WEATHER CONDITIONS, THE CONTRACTOR WILL COMPLETELY CLEAN UP ALL AREAS AND MAINTAIN THE SURFACE IN GOOD CONDITION DURING THE SHUT-DOWN PERIOD.
9. THE CONTRACTOR'S PERSONNEL, EQUIPMENT, AND OPERATIONS SHALL COMPLY FULLY WITH ALL APPLICABLE STANDARDS, REGULATIONS, AND REQUIREMENTS OF EXISTING FEDERAL, COLORADO STATE, AND LOCAL GOVERNMENTAL AGENCIES.
10. ALL WORK SHALL BE CONTAINED IN OR LIMITED TO THE REDLANDS WATER AND POWER COMPANY PROPERTY, EASEMENTS, OR APPROVED STAGING AREAS.
11. CONTRACTOR SHALL MINIMIZE PIPELINE TRENCHES LEFT OPEN OVERNIGHT. FOR OPEN TRENCHES, CONTRACTOR TO PROVIDE, CONSTRUCT, MAINTAIN AND REMOVE A TEMPORARY SAFETY FENCE AND COVER.
12. THE ENGINEER WILL PROVIDE VERTICAL AND HORIZONTAL CONTROLS ONE TIME ON THE PROJECT SITE. ANY ADDITIONAL CONSTRUCTION STAKING REQUIRED TO COMPLETE THE PROJECT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR TO CHECK CONTROL PRIOR TO USING.
13. CONTRACTOR SHALL LOCATE AND PROTECT ALL EXISTING UTILITIES AND BE RESPONSIBLE FOR DAMAGES TO EXISTING UTILITIES AND EXISTING IMPROVEMENTS AS A RESULT OF THE CONTRACTOR'S CONSTRUCTION ACTIVITIES.
14. ALL PIPE FUSION (BUTT, SIDE, AND ELECTROFUSION) MUST BE COMPLETED BY CERTIFIED TECHNICIAN AS OUTLINED IN SPECIFICATION 02513.

EXISTING UTILITIES

1. APPROXIMATE LOCATIONS OF UTILITIES ARE SHOWN ON THE PLANS. THEY ARE TO BE USED FOR GENERAL INFORMATION ONLY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE APPROPRIATE UTILITY COMPANIES WHEN CONSTRUCTION MIGHT INTERFERE WITH NORMAL OPERATION OF ANY UTILITIES. IT SHALL ALSO BE THE CONTRACTOR'S RESPONSIBILITY TO HAVE THE APPROPRIATE UTILITY COMPANY FIELD-LOCATE ANY UTILITY INSTALLATIONS WHICH MIGHT BE AFFECTED BY CONSTRUCTION PRIOR TO BEGINNING WORK IN THAT AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING SERVICE OF EXISTING UTILITIES AND FOR RESTORING ANY UTILITIES DAMAGED DUE TO CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER. DEPTHS AND ELEVATIONS OF UTILITIES ARE UNKNOWN UNLESS OTHERWISE SHOWN. CONTRACTOR SHALL FIELD VERIFY UTILITY DEPTHS, ELEVATIONS, ANY DISCREPANCIES AND/OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.

INSPECTION AND TESTING

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MATERIALS TESTING INCLUDING BUT NOT LIMITED TO CONCRETE, LEAK, PRESSURE, AND COMPACTION. ALL TESTS SHALL MEET MINIMUM ENGINEER REQUIREMENTS. SEE THE CONTRACT DOCUMENTS AND DRAWINGS FOR FREQUENCY OF TESTING. RESULTS ARE TO BE DELIVERED TO SPECIAL INSPECTOR, OWNER AND ENGINEER.
2. THE CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ENGINEER AND SPECIAL INSPECTOR FOR INSPECTIONS OF WORK AT APPROPRIATE INTERVALS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PAY FOR ADDITIONAL INSPECTIONS THAT ARE THE RESULT OF DEFICIENCIES IN HIS WORKMANSHIP.

CONTACT PHONE NUMBERS

REDLANDS WATER AND POWER –			
KYLE VANDERBERG	970-822-2985 m 970-243-2173 o		SUPERINDENDENT
ENGINEER –			
ERIK SNYDER	970-208-8508 o		PROJECT ENGINEER
NICK EMMENDORFER	720-323-9408 m		PROJECT MANAGER

811 Know what's below. Call before you dig.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

J-U-B ENGINEERS, INC.

J-U-B ENGINEERS, INC.
305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP.	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

GENERAL NOTES & VICINITY MAP

FILE : 81-19-015 PUMPLINE-G-002
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/15/2020

SHEET NUMBER:
G-002

Plot Date:1/22/2020 9:21 AM Plotted By: Erik Snyder
Date Created:11/20/2019 \81-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SYS\81-19-015\PUMPLINE REPLACEMENT DESIGN\CAD\SHEET\GENERAL\81-19-015 PUMPLINE-G-002.DWG

LINE LEGEND

LINE DESCRIPTION	PROPOSED LINE	EXISTING LINE
POWER / COMMUNICATIONS		
OVERHEAD POWER	OHP	OHP
UNDERGROUND POWER	UP	UP
OVERHEAD TELEPHONE	OHT	OHT
UNDERGROUND TELEPHONE	UT	UT
FIBER OPTIC	F/O	F/O
CABLE TELEVISION	CTV	CTV
UNDERGROUND POWER, TEL, CABLE TV		P,T,CTV
UNDERGROUND POWER, TEL, CABLE TV, GAS		P,T,CTV,G
STORM DRAIN		
STORM DRAIN (GENERAL)	SD	SD
STORM DRAIN	X"SD	X"SD
ROOF DRAIN	RD	RD
LAND DRAIN	LD	LD
SANITARY SEWER		
SANITARY SEWER (GENERAL)	SS	SS
SANITARY SEWER	X"SS	X"SS
SANITARY SEWER SERVICE	SS SS	SS SS
SEWER FORCE MAIN	FM	FM
WATER		
WATER (GENERAL)	W	W
WATER (SPECIFIED SIZE)	X"W	X"W
WATER SERVICE	WS WS	WS WS
IRRIGATION		
IRRIGATION	IRR	IRR
GRAVITY IRRIGATION	GIRR	GIRR
PRESSURE IRRIGATION	PIRR	PIRR
POTABLE WATER	PW	PW
NON-POTABLE WATER	NPW	NPW
GAS		
NATURAL GAS	G	G
NATURAL GAS SERVICE	G G	G G
HIGH PRESSURE GAS	HPG	HPG
LIQUID GAS	LG	LG
UTILITY		
CHLORINE LINE	CHL	CHL
INDUSTRIAL WASTE WATER	IWW	IWW
DRAIN LINE	DL	DL

LINE DESCRIPTION	PROPOSED LINE	EXISTING LINE
BOUNDARY		
PROPERTY LINE	P/L	P/L
PROPERTY LINE		
RIGHT OF WAY	R/W	R/W
TEMPORARY EASEMENT	T/E	T/E
PERMANENT EASEMENT	P/E	P/E
TOWNSHIP AND RANGE		
SECTION LINE		
QUARTER SECTION LINE		
1/16 SECTION LINE		
STATE LINE		
COUNTY LINE		
SITE		
FENCE	X	X
MAJOR CONTOUR	2521	
MINOR CONTOUR		
GRADE BREAK		GB
TOP OF BANK		TOB
TOE OF SLOPE		TOE
CUT LIMITS		
CUT LIMITS	CUT	
FILL LIMITS		
FILL LIMITS	FILL	
DITCH		
STORM SWALE		
EDGE OF WATER		
HIGH WATER		
WETLAND		WET
WETLAND BOG		BOG
WETLAND MARSH		MRSH
WETLAND SWAMP		SWMP
ROADWAY		
ROAD SHOULDER		
ROAD CENTERLINE		
ROAD ASPHALT		EP
ROAD GRAVEL	EG	EG
TOP BACK OF CURB		
LIP OF GUTTER		
LANDSCAPING LIMITS	LS	LS

SHEET NUMBERING

SAMPLE: C-101

C – 1 01

- DISCIPLINE DESIGNATOR
- SHEET TYPE DESIGNATOR
- SHEET SEQUENCE NUMBER

DISCIPLINE DESIGNATORS

DISCIPLINE	DESIGNATOR	DESCRIPTION
GENERAL	G	ALL GENERAL
	GI	GENERAL INFORMATION
	GC	GENERAL CONTRACTUAL
	GR	GENERAL RESOURCE
SURVEY/MAPPING	V	ALL SURVEY
GEOTECHNICAL	B	ALL GEOTECHNICAL
CIVIL	C	ALL CIVIL
LANDSCAPE	L	ALL LANDSCAPE
STRUCTURAL	S	ALL STRUCTURAL
ARCHITECTURAL	A	ALL ARCHITECTURE
EQUIPMENT	Q	ALL EQUIPMENT
MECHANICAL	M	ALL MECHANICAL
ELECTRICAL	E	ALL ELECTRICAL
PLUMBING	P	ALL PLUMBING
PROCESS	D	ALL PROCESS
RESOURCE	R	ALL RESOURCE

SHEET TYPE DESIGNATORS

DESIGNATOR	SHEET TYPE
0	GENERAL (SYMBOLS, LEGENDS, NOTES, ETC.)
1	PLANS (HORIZONTAL VIEWS)
2	ELEVATIONS, PROFILES, COMBINED PLAN & PROFILES
3	SECTIONS (SECTIONAL VIEWS)
4	LARGE-SCALE VIEWS (PLANS, ELEVATIONS, ECT.)
5	DETAILS OR COMBINED DETAILS AND SECTIONS
6	SCHEDULES AND DIAGRAMS
7	USER DEFINED
8	USER DEFINED
9	3D REPRESENTATIONS (ISOMETRICS, PERSPECTIVES, PHOTOS)

SECTION AND DETAIL IDENTIFIERS

NOTE:
A DASH MAY BE PLACED IN THE LOWER PORTION OF THE IDENTIFIER IF THE DETAIL DRAWING OR SECTION VIEW IS LOCATED ON THE SAME SHEET.

	SECTION IDENTIFICATION	DETAIL IDENTIFICATION
CALLOUT	SECTION LETTER: A; SHEET NUMBER WHERE DETAIL DRAWING IS LOCATED: C-501	DETAIL NUMBER: 1; SHEET NUMBER WHERE DETAIL DRAWING IS LOCATED: C-501
LABEL	A SECTION SCALE:	1 DETAIL SCALE:

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Palisade, CO 81526
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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP'L	DATE
REVISION				

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

LINE LEGEND & DETAIL KEY

FILE : 81-19-015 PUMPLINE-G-003
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 1/15/2020

SHEET NUMBER:
G-003

Plot Date:1/22/2020 9:22 AM Plotted By: Erik Snyder
Date Created:11/20/2019 \\jt1-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015 PUMPLINE REPLACEMENT DESIGN\CAD\SHEET\GENERAL\81-19-015 PUMPLINE-G-003.DWG

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
SURVEY		
CAP (ALUMINUM)		
CAP (BRASS)		
CHISELED X		
CTRL PT GENERIC		
CTRL PT ½" REBAR	1/2" PIN CONTROL PT	
CTRL PT ⅝" REBAR	5/8" PIN CONTROL PT	
CTRL PT 60D NAIL	60D	
CTRL PT HUB & TACK	HT	
CTRL PT PK NAIL	PK	
CTRL PT TEMP BENCH MARK	TBM	
NAIL		
NAIL AND TAG	N/T	
NAIL (PK)	PK	
BOLT		
DRILL STEEL		
REBAR (½")		
REBAR (⅝")		
STAINLESS STEEL ROD		
IRON PIPE		
RAILROAD SPIKE		
R/W MONUMENT		
STONE		
SECTION CORNER. MON.	22 15 / 21 16	
SECTION QUARTER MON.	15 / 22	
SITE		
BOLLARD		
BOULDER		
DRINKING FOUNTAIN	DF	
FLAGPOLE	F	F
GATE		
MAIL BOX	M	M
PARKING METER	PM	PM
POST		
SIGN		
SPOT ELEVATION		
TREE (SHRUB)		
TREE (STUMP)		
TREE (CONIFEROUS)		
TREE (DECIDUOUS)		
TEST HOLE	TH	
WELL	W	
WELL (MONITORING)	M	M

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
UTILITIES		
MANHOLE (GENERIC)		
PRESSURE CLEAN OUT AT GRADE	PCO	PCO
THRUST BLOCK		
VAULT	V	V
COMMUNICATION		
TELE. MANHOLE	T	
TELE. PEDASTAL	T	T
TELE. POLE		
TV PEDASTAL	TV	TV
GUY WIRE		
DOMESTIC WATER		
FIRE HYDRANT		
SPIGOT		
YARD HYDRANT		
WATER MANHOLE	W	
WATER METER		
WATER VALVE	W	W
ELECTRIC		
ELEC. MANHOLE	E	
ELEC. METER	E	E
ELEC. TRANS.	E	E
JUNCTION BOX	J	J
POWER POLE		
POWER STUB	E	E
STREET LIGHT		
TRAFFIC SIGNAL POLE		
IRRIGATION		
IRRIGATION VALVE	IRR	IRR
IRRIGATION VALVE BOX		
SPRINKLER		
NATURAL GAS		
GAS METER	G	G
GAS VALVE	G	G
SANITARY SEWER		
CLEANOUT		
SEWER STUB	S	S
SS MANHOLE		
STORM DRAIN		
CATCH BASIN		
DRY WELL	DW	DW
FLARE END		
GREASE TRAP		
SD MANHOLE		

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
FITTINGS		
BEND (11.25°)		
BEND (22.5°)		
BEND (45°)		
BEND (90°)		
CAP		
COUPLING		
CROSS		
REDUCER (CONCENTRIC)		
REDUCER (ECCENTRIC)		
TEE		
TRUE UNION		
WYE		
VALVES		
AIR VALVE	A	A
BLOW OFF	B	B
COMBO VALVE	C	C
BALL VALVE (N.C.)		
BALL VALVE (N.O.)		
BUTTERFLY VALVE		
CHECK VALVE		
CHECK VALVE (FLANGE)		
CHECK VALVE (MJ)		
GATE VALVE		
PLUG VALVE (N.C.)		
PLUG VALVE (N.O.)		
ROAD MARKINGS		
TURN ARROW		
ARROW STRAIGHT		
ARROW STRAIGHT/TURN		
BICYCLE ROUTE		
CAR		
HANDICAP SYMBOL		
ROADWAY		
INTERSTATE ROUTE	25	
MAST ARM		
PEDESTRIAN SIGNAL		
STATE ROUTE	14	
TRAFFIC LIGHT		

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
ROADWAY (CONT.)		
TYPE 2 BARRICADE		
US ROUTE	287	
TRAFFIC ATTENUATOR		
JERSEY BARRIER		

ABBREVIATIONS

ASSY	ASSEMBLY
>	ANGLE
@	AT (MEASUREMENTS)
BLDG	BUILDING
BM	BENCH MARK
BSC	BITUMINOUS SURFACE COURSE
BSW	BACK OF SIDEWALK
BW	BOTH WAYS
C	CHANNEL (STRUCTURAL)
C/L	CENTER LINE
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
CONT	CONTINUOUS
CPLG	COUPLING
CU FT	CUBIC FEET
CU YD	CUBIC YARD
DEG OR °	DEGREE
DET	DETAIL
DIA OR ø	DIAMETER
DIP	DUCTILE IRON PIPE
DIST	DISTRIBUTION
DWG	DRAWING
EA	EACH
ELB	ELBOW
ELEV	ELEVATION
EW	EACH WAY
EXIST	EXISTING
FG	FINISH GRADE
FH	FIRE HYDRANT
FLG	FLANGE
FT OR '	FEET
GV	GATE VALVE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IN OR "	INCH
LB OR #	POUND
LF	LINEAL FEET
LN	LINEAL
MAX	MAXIMUM
MIN	MINIMUM
NO OR #	NUMBER
PE	POLYETHYLENE
PL	PLATE
PL	PROPERTY LINE
PVC	POLYVINYL–CHLORIDE
R	RADIUS
RP	RADIUS POINT
R&R	REMOVE & REPLACE
REM	REMOVE
REQ'D	REQUIRED
REV	REVISION
R/W	RIGHT–OF–WAY

S	SLOPE
SPEC	SPECIFICATION
STA	STATION
STD	STANDARD
STL	STEEL
ST STL	STAINLESS STEEL
TBC	TOP BACK OF CURB
TYP	TYPICAL
TFC	TOP FACE OF CONCRETE
W/	WITH
W/O	WITHOUT
W/REQ'D	WHERE REQUIRED

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Palisade, CO 81526
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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP'L	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

SYMBOL LEGEND & ABBREVIATIONS

FILE : 81-19-015 PUMPLINE-G-004
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE

ONE INCH
AT FULL SIZE. IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 1/15/2020

SHEET NUMBER:
G-004

Plot Date:1/22/2020 9:22 AM Plotted By: Erik Snyder
Date Created:11/20/2019 \\jt1-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015 PUMPLINE REPLACEMENT DESIGN\CADD\SHEET\GENERAL\81-19-015 PUMPLINE-G-004.DWG

JUB PROPOSED ALIGNMENT SEGMENT TABLE

SEGMENT #	DELTA	RADIUS	LENGTH	LINE/CHORD DIRECTION	START STATION	END STATION
L1			28.90'	N09°28'44"E	0+00.00	0+28.90
C1	6°13'35.94"	280.00'	30.43'	N05°43'06"E	0+28.90	0+59.33
L2			17.03'	N02°36'18"E	0+59.33	0+76.36
C2	7°33'32.85"	280.00'	36.94'	N06°23'04"E	0+76.36	1+13.30
L3			425.06'	N10°09'51"E	1+13.30	5+38.36
C4	0°26'43.61"	280.00'	2.18'	N10°23'12"E	5+38.36	5+40.54
L4			200.48'	N10°36'34"E	5+40.54	7+41.02
C3	23°12'22.23"	280.00'	113.41'	N22°21'56"E	7+42.99	8+56.39
L5			143.50'	N33°58'07"E	8+84.44	10+27.95
L6			13.46'	N78°57'47"E	10+37.70	10+51.16
L7			11.56'	S89°02'41"E	10+51.16	10+62.72

2774 ½ BROADWAY
2945-164-00-112

2472 BROADWAY
2945-164-00-110

ALIGNMENT
JUB PROPOSED ALIGNMENT
STA: 0+00.00 0.00'
N: 34738.74
E: 82787.58

CP/ SPIKE
EL: 4576.740
N: 35797.5000
E: 82950.9800

0+00 L1 1+00 C1 L2 2+00 C2 3+00 L3 4+00 5+00 C4 6+00 L4 7+00 C3 8+00 9+00 L5 10+00 L7 10+63

BROADWAY

20.0' EXCEPTION FOR RIGHT-OF-WAY
BY ORIGINAL PLAT FOR MAYS SUBDIVISION
RECEPTION NUMBER 854108

REDLANDS WATER AND POWER COMPANY
2945-164-00-306

CP/ SPIKE
EL: 4579.140
N: 35745.1200
E: 83014.4000

80L
70R
POWER CANAL

2476 BROADWAY
2945-164-00-111

2476 BROADWAY
2945-164-00-011

409 W. MAYFIELD DR
2945-164-08-017

411 W. MAYFIELD DR
2945-164-08-016

2478 BROADWAY
2945-164-08-018

MANSFIELD CT

W MAYFIELD DR

ALIGNMENT
JUB PROPOSED ALIGNMENT
STA: 10+62.72 0.00'
N: 35727.64
E: 83081.86

NOTES
1. AERIAL IMAGE IS APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.

0 40 80
SCALE IN FEET

N

Plot Date:1/22/2020 9:22 AM Plotted By: Erik Snyder
Date Created:11/25/2019 I:\81-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\81-19-015 PUMPLINE-V-101X.DWG

J-U-B ENGINEERS, INC.
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305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

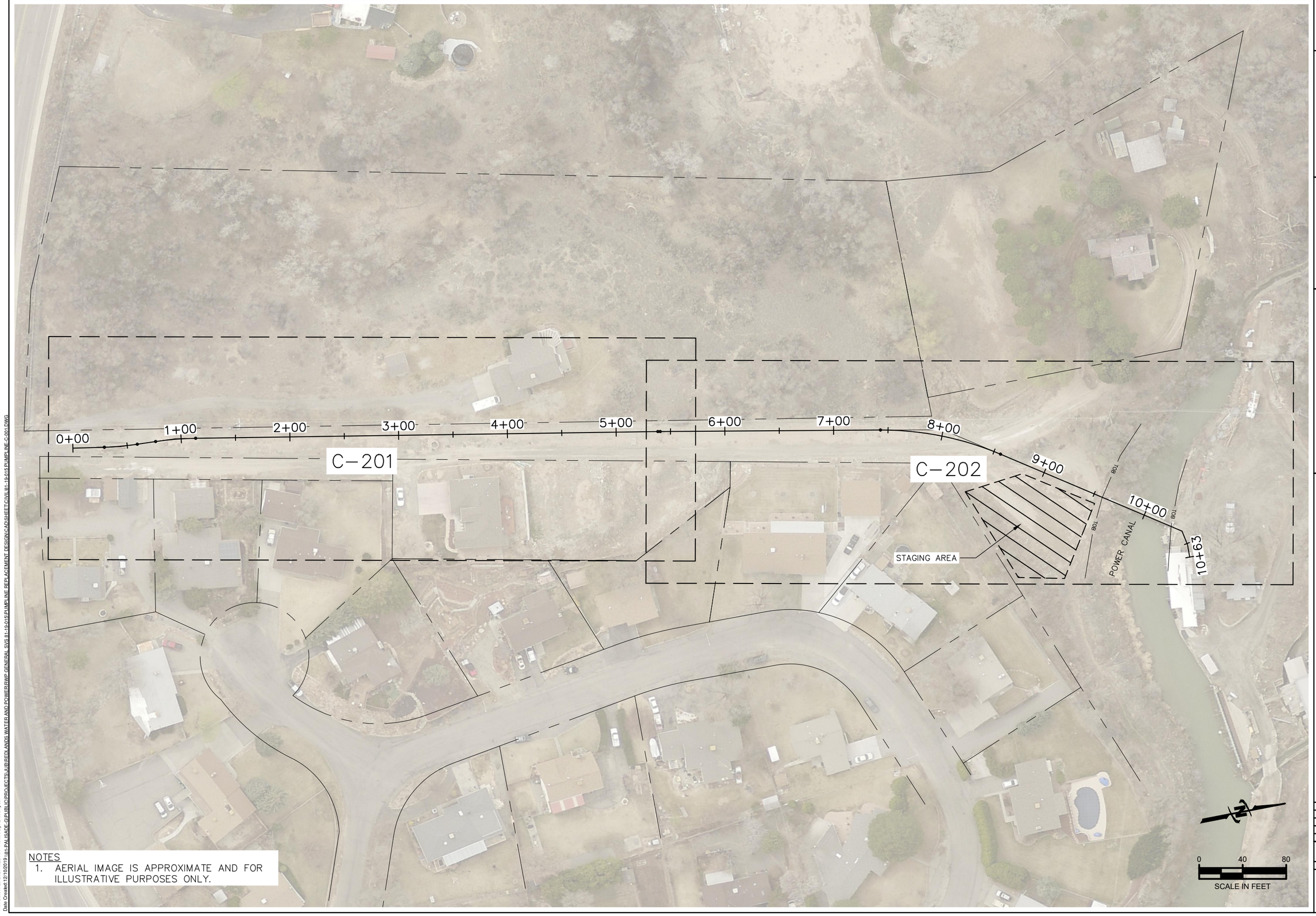
NO.	DESCRIPTION	BY	APP'D	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

SURVEY CONTROL

FILE : 81-19-015 PUMPLINE-V-101X
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/20/2020

SHEET NUMBER:
V-101



NOTES
1. AERIAL IMAGE IS APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.

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J-U-B ENGINEERS, INC.
305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP'D	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

SHEET KEY & OVERALL LAYOUT

FILE : 81-19-015 PUMPLINE-C-001
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/15/2020

SHEET NUMBER:
C-101

Plot Date:1/22/2020 9:22 AM Plotted By: Erik Snyder
Date Created:12/10/2019 I:\p1-PALISADE-GI\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\CIVIL\81-19-015 PUMPLINE-C-001.DWG

TEMPORARY DISHED HEAD PLUG STA 0+00 — 4/C-504, 5/C-504

PROPOSED HDPE THRUST BLOCK STA 0+15 — 3/C-501

CONNECT PROPOSED 4" HDPE TO PROPOSED 48" HDPE STA 0+20 — 3/C-503

UNDERGROUND COMM LINE APPROXIMATE LOCATION. FIELD LOCATE PRIOR TO PIPE INSTALLATION

EXISTING PUMPLINE. REMOVE AIR VALVE AND PIPING. WELD PLUG ON PIPING TO SEAL

EXISTING 48" STEEL PIPE

PRESSURE VALVE & VALVE BOX

PROPOSED 2" SERVICE STA 3+26 — 3/C-502

2472 BROADWAY
2945-164-00-110

MATCH LINE 5+50
SEE SHEET C-202

3' WOOD FENCE

GRAVEL DRIVE

4' WIRE FENCE

6' WOOD FENCE

GRAVEL ROAD

PROPOSED 3" SERVICE STA 0+23 — 3/C-502

20.0' EXCEPTION FOR RIGHT-OF-WAY BY ORIGINAL PLAT FOR MAYS SUBDIVISION RECEPTION NUMBER 854108

2'H x 1'W ROCK WALL

PROPOSED 2" SERVICE STA 3+26 — 3/C-502

REMOVE AND DISPOSE OF EXISTING 48" STEEL PIPE FROM STA 0+05 TO STA 1+23

ABANDON EXISTING 48" STEEL PIPE STA 1+23 — 2/C-503

CONNECT PROPOSED 48" HDPE TO EXISTING STEEL PIPE STA 0+05 — 1/C-503

10' EASEMENT BOOK 9, PAGE 183

LOT 5
2478 BROADWAY
2945-164-08-018

LOT 6
MAYS SUBDIVISION
RECEPTION NUMBER 854108
409 W. MAYFIELD DR
2945-164-08-017

LOT 7
411 W. MAYFIELD DR
2945-164-08-016

2476 BROADWAY
2945-164-00-111

0 20 40
SCALE IN FEET

48" DR 32.5 HDPE (AT GRADES SHOWN ON PROFILE)
(STA 0+05 TO 8+00)

EXISTING GROUND

STA 3+26
2" SERVICE
(E+W)

EXISTING THRUST BLOCK
(4.0'L x 5.8'W x 6.5'D)

STA 0+23
3" SERVICE
(E+W)

PROPOSED INVERT
48" DR 32.5 HDPE

PROPOSED INVERT
4" DR 17 HDPE

EXISTING 48" STEEL PIPE INVERT

STA 0+15
PROPOSED HDPE
THRUST BLOCK

2.23% 0.05% 2.92% 6.24% 12.02% 13.94%

ELEV: 4649.49
PVI:0+05.24

ELEV: 4644.65
PVI:2+13.50

ELEV: 4644.78
PVI:3+51.00

ELEV: 4642.51
PVI:4+28.62

ELEV: 4640.49
PVI:4+61.01

ELEV: 4631.29
PVI:5+37.52

4690 4685 4680 4675 4670 4665 4660 4655 4650 4645 4640 4635 4630 4625 4620 4615 4610 4605 4600

0+00 0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00 5+50

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305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP'D	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

PLAN & PROFILE

FILE: 81-19-015 PUMPLINE-C-20X
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/15/2020

SHEET NUMBER:
C-201

Plot Date:1/22/2020 9:23 AM Plotted By: Erik Snyder
Date Created:10/30/2019 I:\81-PALISADE-G\PUBLIC\PROJECTS\SUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\CIVIL\81-19-015 PUMPLINE-C-20X.DWG

2472 BROADWAY
2945-164-00-110

2774 ½ BROADWAY
2945-164-00-112

PROPOSED HDPE THRUST BLOCK
STA 8+75 (SEE NOTE 4)
3 / C-501

ABANDON EXISTING
48" STEEL PIPE
STA 7+43
2 / C-503

PROPOSED 2" SERVICE
STA 7+91
3 / C-502

CONNECT PROPOSED 4" HDPE
TO PROPOSED 48" HDPE
STA 7+95
3 / C-503

EXISTING 48" STEEL PIPE

4' WIRE FENCE

REMOVE AND
REPLACE
GRAVEL ROAD

CONNECT PROPOSED 48" HDPE
TO PROPOSED STEEL PIPE
STA 8+85 (SEE NOTE 3)
1 / C-503

CP / SPIKE
EL: 4576.740
N: 35797.5000
E: 82950.9800

REDLANDS WATER AND POWER COMPANY
2945-164-00-306

SEE STRUCTURAL DETAILS
FOR MODIFICATIONS TO
ABOVE-GRADE CROSSING

PROPOSED 2" SERVICE
STA 9+39
2 / C-502

PROPOSED 2" SERVICE
STA 6+06
3 / C-502

PROPOSED 2" SERVICE
STA 6+23
3 / C-502

APPROXIMATE LOCATION OF
WATERLINE SERVICE. USE
CAUTION WHEN EXCAVATING
WITHIN THIS AREA.

PROPOSED CATHODIC PROTECTION
STA 8+90
4 / C-503 · 5 / C-503 · 6 / C-503

CP / SPIKE
EL: 4579.140
N: 35745.1200
E: 83014.4000

SEE PUMPHOUSE
CONNECTION
4 / C-505

2476 BROADWAY
2945-164-00-111

LOT 11
MAYS SUBDIVISION
RECEPTION NUMBER 854108
421 W. MAYFIELD DR
2945-164-08-012

PROPOSED 2" SERVICE
STA 9+37
2 / C-502

ULTRASONIC
METER PIT
1 / C-504

MATCH LINE 5+50
SEE SHEET C-201

REMOVE AND DISPOSE OF EXISTING
48" STEEL PIPE FROM STA 7+43
TO PUMPHOUSE

NOTES
1. ALL STEEL JOINTS TO BE INSTALLED PER_DETAIL (2/C-505).
2. WHERE POSSIBLE, USE EXISTING STEEL PIPE IN REDLANDS WATER AND POWER STORAGE.
3. ADJUST LOCATION OF CONNECTION BETWEEN HDPE AND STEEL BASED ON AVAILABLE STEEL PIPE INVENTORY.
4. HDPE THRUST BLOCK TO BE PLACED 10 FT FROM STEEL CONNECTION ON HDPE. ADJUST LOCATION BASED ON FINAL CONNECTION TO STEEL PIPE.

0 20 40
SCALE IN FEET

48" DR 32.5 HDPE (AT GRADES SHOWN ON PROFILE)
(STA 0+05 TO 8+00)

48" DR 21 HDPE (AT GRADES SHOWN ON PROFILE)(STA 8+00 TO 8+85)

48" STEEL (AT GRADES SHOWN ON PROFILE)
(STA 8+85 TO 10+63)
(SEE NOTE 1)

STA 6+06
2" SERVICE
(E)

STA 6+23
2" SERVICE
(E)

EXISTING GROUND

EXISTING THRUST BLOCK
(2.0'L x 5.7'W x 6.5'D)

EXISTING THRUST BLOCK
(3.0'L x x'W x 6.3'D)

EXISTING THRUST BLOCK
(6.8'L x 8'W x 6.5'D)

-13.94%
-11.89%
-13.03%
-8.50%
-11.32%

PROPOSED INVERT
48" DR 32.5 HDPE

PROPOSED INVERT
4" DR 17 HDPE

EXISTING 48" STEEL PIPE INVERT

ELEV: 4623.91
PVI:5+90.50

ELEV: 4608.82
PVI:7+17.44

STA 7+91
2" SERVICE
(E)

APPROXIMATE LOCATION OF
WATERLINE SERVICE. USE
CAUTION WHEN EXCAVATING
WITHIN THIS AREA.

HDPE TO STEEL PIPE CONNECTION

STA 9+37
STA 9+39
2" SERVICE
(W)

PROPOSED INVERT
48" DR 21 HDPE

PROPOSED HDPE THRUST BLOCK

ELEV: 4587.24
PVI:8+83.09

PROPOSED INVERT
48" STEEL

POWER CANAL

ELEV: 4574.15
PVI:10+37.03

ELEV: 4571.21
PVI:10+63.00

4650 4645 4640 4635 4630 4625 4620 4615 4610 4605 4600 4595 4590 4585 4580 4575 4570 4565 4560

5+50 6+00 6+50 7+00 7+50 8+00 8+50 9+00 9+50 10+00 10+50 11+00

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PRELIMINARY PLANS

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NO.	DESCRIPTION	BY	APP'L	DATE
	REVISION			

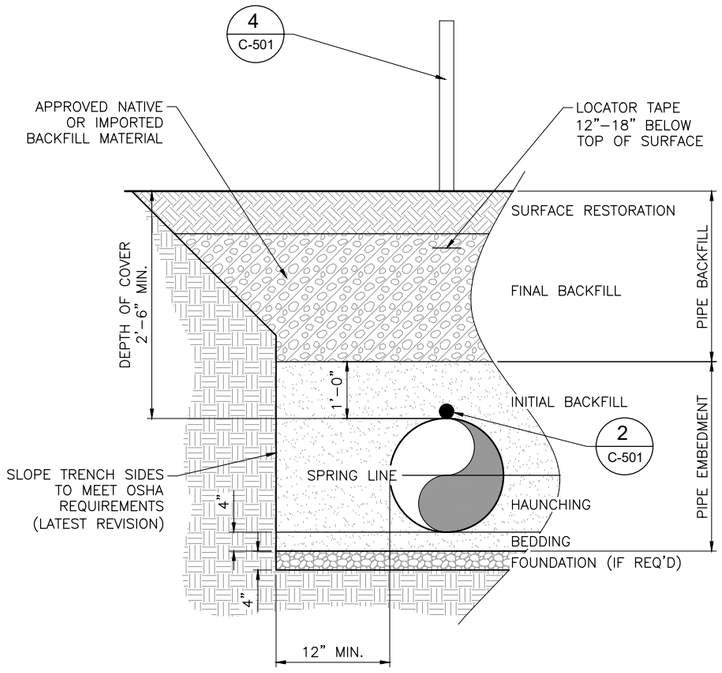
PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

PLAN & PROFILE

FILE: 81-19-015 PUMPLINE-C-20X
JUB PROJ. #: 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/15/2020

SHEET NUMBER:
C-202

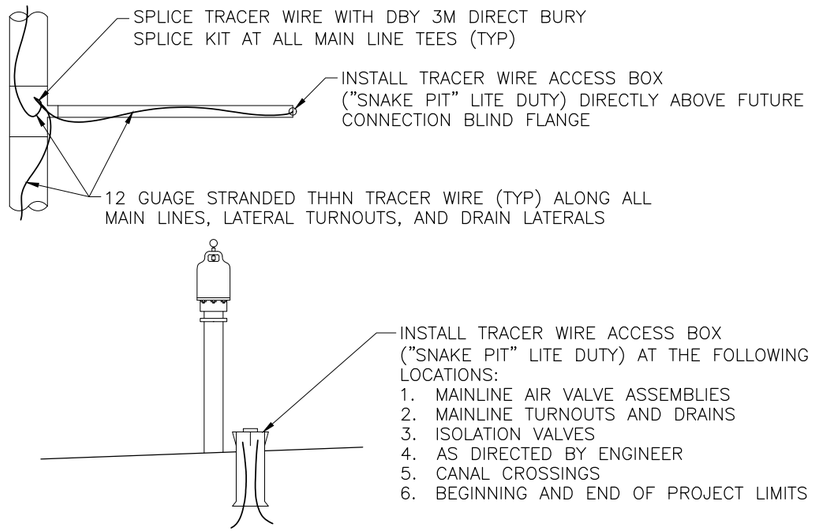
Plot Date:1/22/2020 9:23 AM Plotted By: Erik Snyder
Date Created:10/30/2019 \\s1-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\CIVIL\81-19-015 PUMPLINE-C-20X.DWG



1 TYPICAL TRENCH EXCAVATION AND BACKFILL
SCALE: N.T.S.

TRENCH BACKFILL NOTES:

1. SURFACE RESTORATION:
   A. USE APPROVED NATIVE OR IMPORTED BACKFILL MATERIAL.
2. FINAL BACKFILL:
   A. 85% COMPACTION TYPICAL.
   B. 95% COMPACTION IN ROAD RIGHT–OF–WAY AND DRIVE WAYS.
   C. USE ASTM D 1557 MODIFIED PROCTOR FOR COUNTY ROADWAYS.
   D. USE ASTM D 695 STANDARD PROCTOR FOR ALL OTHER AREAS.
   E. SUBSOIL TYPE S1, ONSITE BACKFILL TYPE A2, IMPORTED GRANULAR FILL TYPE A1.
   F. INSTALL MAGNETIC LOCATOR TAPE 12"–18" BELOW FINISHED SURFACE. CENTER TAPE IN TRENCH.
3. EMBEDMENT:
   A. ONSITE EMBEDMENT TYPE A4, IMPORTED EMBEDMENT TYPE A3. LIMIT PARTICLE SIZE TO 1".
   B. INITIAL BACKFILL:
      B.1. 90% COMPACTION
      B.2. FILL VOIDS BETWEEN PIPE AND TRENCH SIDES.
      B.3. USE HAND HELD OR WALK BEHIND COMPACTION EQUIPMENT TO PROTECT PIPE.
      B.4. LIFT THICKNESS: MAX. 8" UNCOMPACTED.
   C. HAUNCHING:
      C.1. 90% COMPACTION
      C.2. SHOVEL–SLICE AND MANUAL TAMP EMBEDMENT MATERIAL TO ASSURE ALL VOIDS BETWEEN THE PIPE AND THE TRENCH BOTTOM AND SIDES ARE FILLED.
      C.3. COMPACT MATERIAL TO PROVIDE COMPLETE CONTACT WITH PIPE BOTTOM.
   D. BEDDING:
      D.1. LEVEL EMBEDMENT MATERIAL OR APPROVED UNDISTURBED NATIVE MATERIAL TO PROVIDE CONTINUOUS FIRM SUPPORT ALONG FULL LENGTH OF PIPE. HIGH SPOTS SHOULD BE SHAVED OFF AND LOW SPOTS FILLED WITH WELL TAMPED SOIL. EXCAVATE A BELL HOLE, IF NECESSARY, TO ASSURE NO UNDUE WEIGHT IS PLACED ON BELL AND THAT THE PIPE BARREL IS SUPPORTED.
4. FOUNDATION:
   A. NATIVE OR IMPORTED FOUNDATION TYPE A5, AS DIRECTED BY ENGINEER.
   B. USE FOUNDATION MATERIAL AS REQUIRED TO PROVIDE STRUCTURAL SUPPORT FOR PIPE.

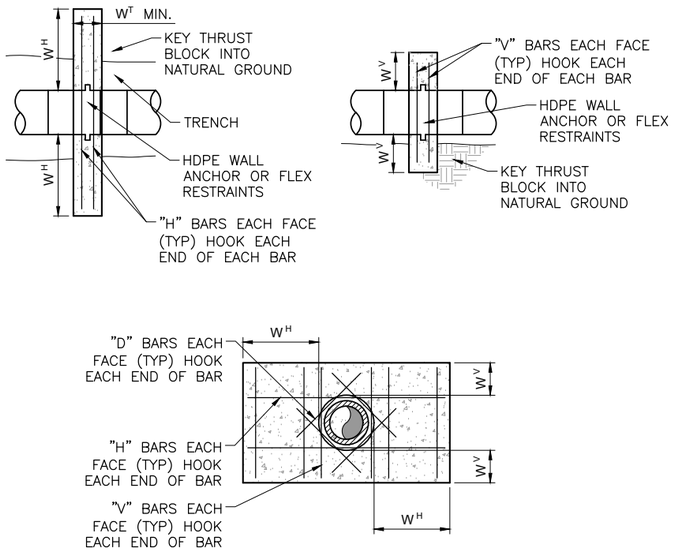


2 TRACER WIRE INSTALLATION
SCALE: N.T.S.

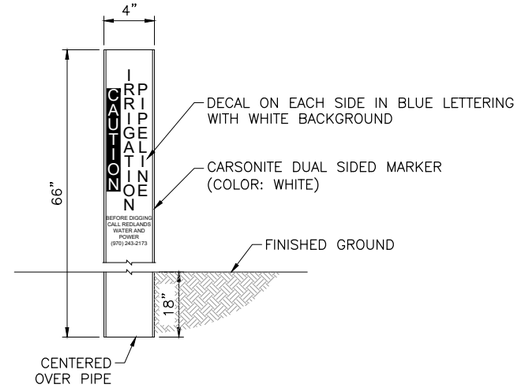
THRUST BLOCK DIMENSIONS										
PIPE SIZE	W^H	W^V	W^T	"H" BARS		"V" BARS		"D" BARS		NUMBER OF FLEX RESTRAINTS
				SIZE	NO.	SIZE	NO.	SIZE	NO.	
48" DR 32.5	3.00'	1.00'	1.50'	#5	8	#5	8	#5	8	14
48" DR 21	3.00'	2.00'	2.00'	#5	8	#5	8	#5	8	22

NOTE:

1. ELECTROFUSION FLEX RESTRAINTS MAY BE USED IN PLACE OF HDPE WALL ANCHOR. SEE TABLE FOR NUMBER OF FLEX RESTRAINTS REQUIRED FOR EACH PIPE SIZE.



3 HDPE THRUST BLOCK DETAIL
SCALE: N.T.S.



NOTE:
LOCATE PIPE MARKERS ALONG PIPELINE WITH MAX SPACING OF 500 FT, INCLUDING ALL FENCE CROSSINGS, BEGINNING, MIDDLE AND END OF CURVES.

4 IRRIGATION PIPE MARKER
SCALE: N.T.S.

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NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APPR.	DATE
REVISION				

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

CIVIL DETAILS SHEET 1 OF 5

FILE :	81-19-015 PUMPLINE-C-501X
JUB PROJ. # :	81-19-015
DRAWN BY:	MF
DESIGN BY:	EWS
CHECKED BY:	NE

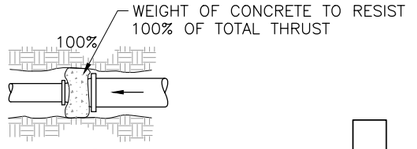
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 1/22/2020

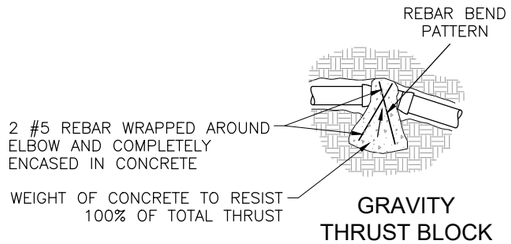
SHEET NUMBER:
C-501

Plot Date: 1/22/2020 9:23 AM Plotted By: Erik Snyder
Date Created: 1/22/2020 \\b1-PALISADE-GP\JBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\CIVIL\81-19-015 PUMPLINE-C-501X.DWG

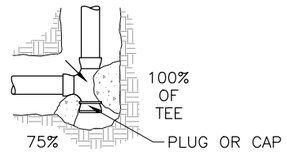
Use for Thrust Blocks on Mainline from Start to STA: 36+50.00						
Line Pressure (psi):		60				
Test Pressure (psi):		90				
Soil Bearing Strength (psf):		1200				
Area of Bearing Required (sq. ft.)						
Pipe Size	Pipe Area	Dead End or Tee	90 Bend	45 Bend	22.5 Bend	11.25 Bend
(")	(sq. in)	(sq ft)	(sq ft)	(sq ft)	(sq ft)	(sq ft)
4	12.6	0.9	1.3	0.7	0.4	0.2
48	1809.6	134.4	192.0	103.9	53.0	26.6



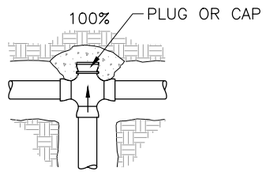
REDUCER
PLAN VIEW



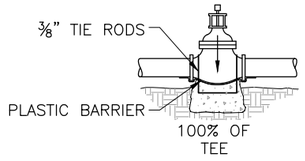
GRAVITY
THRUST BLOCK
ELEVATION VIEW



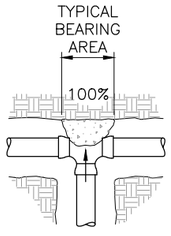
TEE W/ PLUG PLAN VIEW



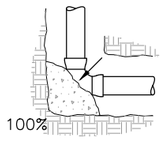
CROSS W/ PLUG PLAN VIEW



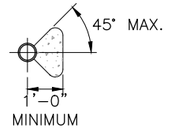
VALVE ELEVATION VIEW



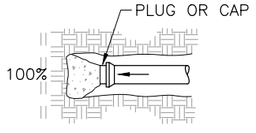
TEE PLAN VIEW



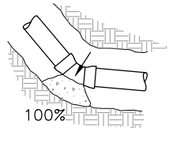
ELBOW PLAN VIEW



TYPICAL SECTION
THRU THRUST BLOCK



DEAD END PLAN VIEW

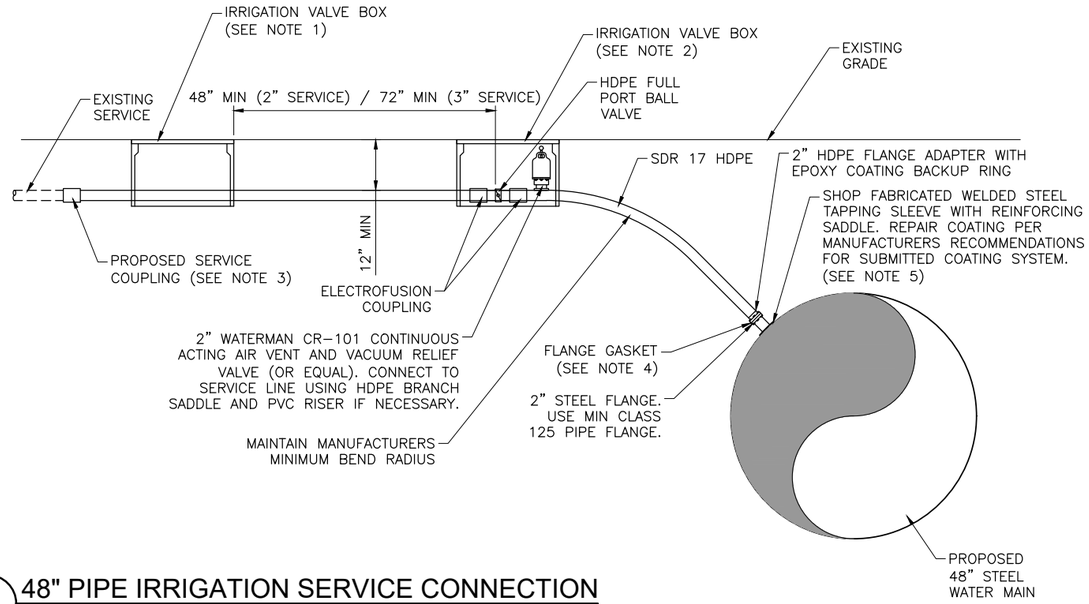


ELBOW PLAN VIEW

NOTES:
1. THE FIGURE (100%) AT THE THRUST BLOCK INDICATES PER CENT OF TOTAL THRUST TO BE APPLIED FOR BEARING AREA.
2. THE ARROW (⟶) INDICATES THRUST DIRECTION.
3. CONCRETE FOR THRUST BLOCKS TO BE 3000 P.S.I. .
4. ALL MJ AND FLANGED FITTINGS TO BE WRAPPED WITH 12 MIL POLYETHYLENE PRIOR TO PLACING CONCRETE THRUST BLOCK
5. WHERE SUFFICIENT BEARING SURFACE IS NOT AVAILABLE FOR THRUST BLOCK, MEGALUG THRUST RESTRAINING GLANDS MAY BE USED. MEGALUG THRUST RESTRAINING GLANDS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION INCLUDING ANY JOINT RESTRAINT. ANY USE OF MEGALUG OR CHANGE TO THE THRUST BEARING CHART MUST BE REVIEWED BY THE ENGINEER.
6. ALL BORE PIT BACKFILL SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 PRIOR TO THRUST BLOCK PLACEMENT.

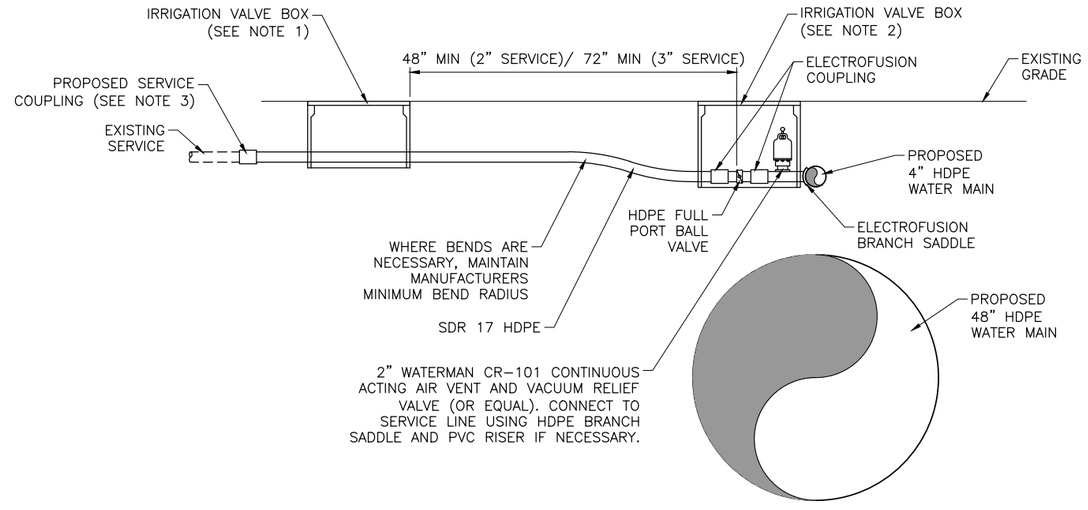
1 THRUST BLOCK DETAILS
SCALE: N.T.S.

NOTES:
1. RUN SERVICE LINE THROUGH VALVE BOX IN PREPARATION FOR FUTURE INSTALLATION OF FLOW METER. VALVE BOX MUST SIZED TO ALLOW A MINIMUM OF 24" LENGTH OF EXPOSED SERVICE LINE IN VALVE BOX BOTTOM. VALVE BOX MUST BE RATED FOR H-20 LOADING.
2. SIZE VALVE BOX TO FIT EQUIPMENT AND IRRIGATION PIPING. VALVE BOX MUST BE RATED FOR H-20 LOADING.
3. SELECT COUPLING BASED ON HDPE MANUFACTURERS RECOMMENDATION FOR CONNECTION TO EXISTING SERVICE PIPE MATERIAL.
4. USE RING TYPE OR FULL-FACE GASKET FOR FLANGED JOINTS. PROVIDE 1/8-INCH CLOTH INSERTED RUBBER GASKET MATERIAL IN ACCORDANCE WITH AWWA C207. CUT GASKETS AT FACTORY FOR PROPER DIMENSIONS.
5. WELD INTERIOR AND EXTERIOR OF SADDLE TO STEEL WATER LINE SUCH THAT HYDROSTATIC TEST PRESSURE CAN BE MAINTAINED WITHOUT LEAKS.



2 48" PIPE IRRIGATION SERVICE CONNECTION
SCALE: N.T.S.

NOTES:
1. RUN SERVICE LINE THROUGH VALVE BOX IN PREPARATION FOR FUTURE INSTALLATION OF FLOW METER. VALVE BOX MUST SIZED TO ALLOW A MINIMUM OF 24" LENGTH OF EXPOSED SERVICE LINE IN VALVE BOX BOTTOM. VALVE BOX MUST BE RATED FOR H-20 LOADING.
2. SIZE VALVE BOX TO FIT EQUIPMENT AND IRRIGATION PIPING. VALVE BOX MUST BE RATED FOR H-20 LOADING.
3. SELECT COUPLING BASED ON HDPE MANUFACTURERS RECOMMENDATION FOR CONNECTION TO EXISTING SERVICE PIPE MATERIAL.



3 IRRIGATION SERVICE CONNECTION
SCALE: N.T.S.

JUB ENGINEERS, INC.
J-U-B ENGINEERS, INC.
305 Main Street
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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP'D	DATE
REVISION				

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

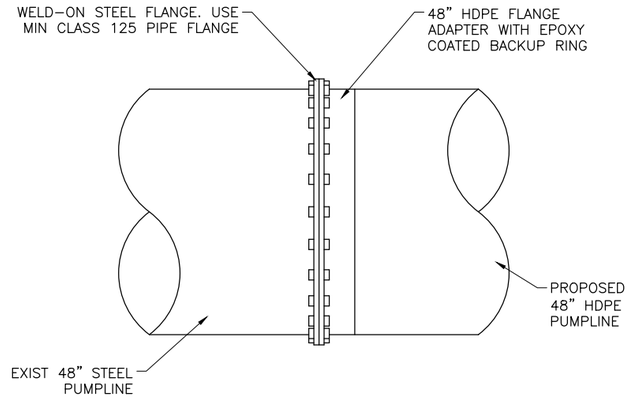
CIVIL DETAILS SHEET 2 OF 5

FILE: 81-19-015 PUMPLINE-C-501X
JUB PROJ. #: 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/22/2020

SHEET NUMBER:
C-502

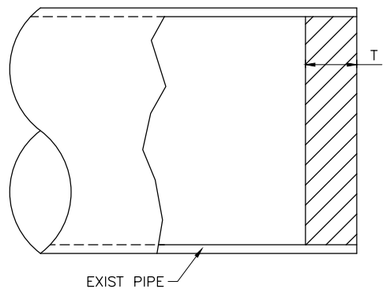
Plot Date:1/23/2020 9:23 AM Plotted By: Erik Snyder
Date Created:1/22/2020 \\81-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CAD\SHEET\CIVIL\81-19-015 PUMPLINE-C-501X.DWG

NOTES:
1. MATCH STEEL WELD–ON FLANGE BOLT PATTERN TO BACKUP RING BOLT PATTERN



1 PROPOSED HDPE TO EXISTING STEEL PIPE CONNECTION
SCALE: N.T.S.

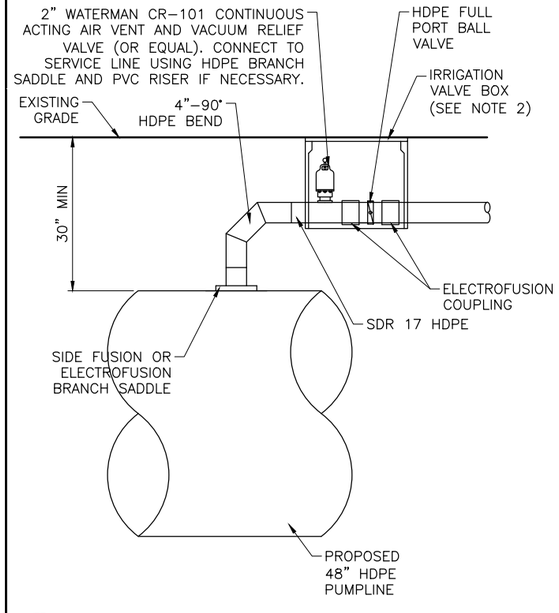
NOTES:
1. PLAN PAY QUANTITIES ARE TO REFLECT PIPE PLUGS AS CU. YDS. OF CONCRETE. CONSTRUCTION PLUGS MAY BE BUILT WITH BRICK MASONRY, MORTAR, OR RUBBLE MASONRY WITH NO ADJUSTMENTS IN PAYMENT MADE FOR ALTERNATES.



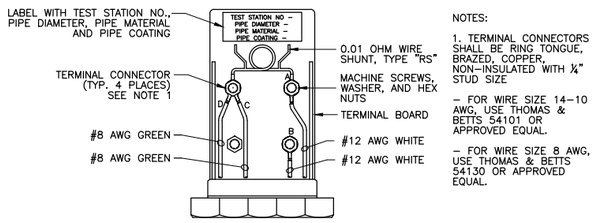
Use for Pipe Abandonment on Mainline		
D	T (MIN)	PIPE PLUG (CU. YDS.)
48 in	8 in	0.3103

2 EXIST STEEL PIPE ABANDONMENT
SCALE: N.T.S.

NOTES:
1. PROPOSED 4" HDPE DISTRIBUTION LINE TO SHARE THE SAME APPROXIMATE ALIGNMENT AS THE PROPOSED 48" HDPE TRANSMISSION LINE.
2. SIZE VALVE BOX TO FIT EQUIPMENT AND IRRIGATION PIPING. VALVE BOX MUST BE RATED FOR H–20 LOADING.

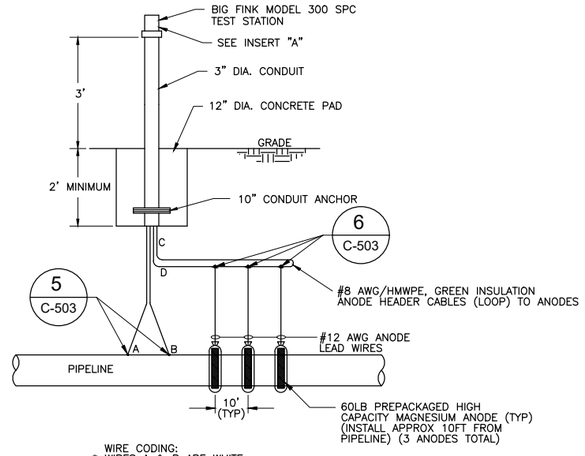


3 48" TO 4" HDPE PIPE CONNECTION
SCALE: N.T.S.



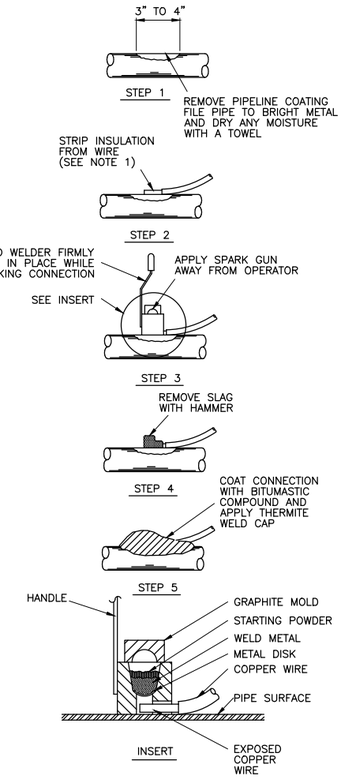
NOTES:
1. TERMINAL CONNECTORS SHALL BE RING TONGUE, BRAZED, COPPER, NON–INSULATED WITH ¼" STUD SIZE
– FOR WIRE SIZE 14–10 AWG, USE THOMAS & BETTS 54101 OR APPROVED EQUAL.
– FOR WIRE SIZE 8 AWG, USE THOMAS & BETTS 54130 OR APPROVED EQUAL.

INSERT "A"



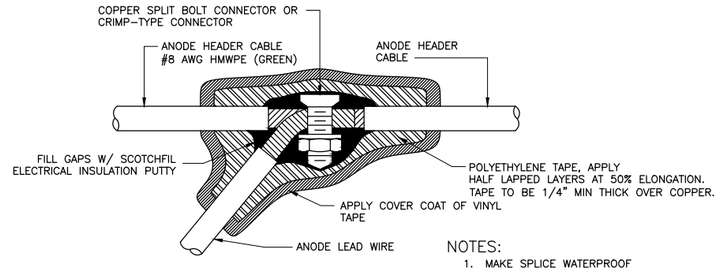
WIRE CODING:
* WIRES A & B ARE WHITE
* WIRES A & B ARE #12 AWG TW SOLID SINGLE CONDUCTOR WIRE
* WIRES C & D ARE GREEN #8 AWG ANODE HEADER CABLES TO ANODE GROUND BED

4 ABOVE GRADE ANODE TEST STATION
SCALE: N.T.S.



NOTES:
1. WHEN #14 SOLID TO #10 SOLID WIRE IS USED, IT WILL BE NECESSARY TO INSTALL A COPPER SLEEVE OF ADEQUATE SIZE OVER BARE SECTION OF WIRE BEFORE CONNECTION IS ATTEMPTED.
2. REPAIR ALL DAMAGE TO COATING AND LINING IN ACCORDANCE WITH MFG. RECOMMENDATIONS.

5 THERMITE BRAZED CONNECTION
SCALE: N.T.S.



NOTES:
1. MAKE SPLICE WATERPROOF
   A. SMOOTH ALL IRREGULAR SURFACES WITH ELECTRICAL INSULATION PUTTY.
   B. APPLY 2 LAYERS OF HALF LAPPED RUBBER SPLICING TAPE.
   C. APPLY 2 LAYERS OF HALF LAPPED VINYL ELECTRICAL TAPE.
2. NUMBER OF WIRES MAY VARY PER SPLICE

6 ANODE LEAD TO COLLECTOR SPLICE DETAIL
SCALE: N.T.S.

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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APPR.	DATE
	REVISION			

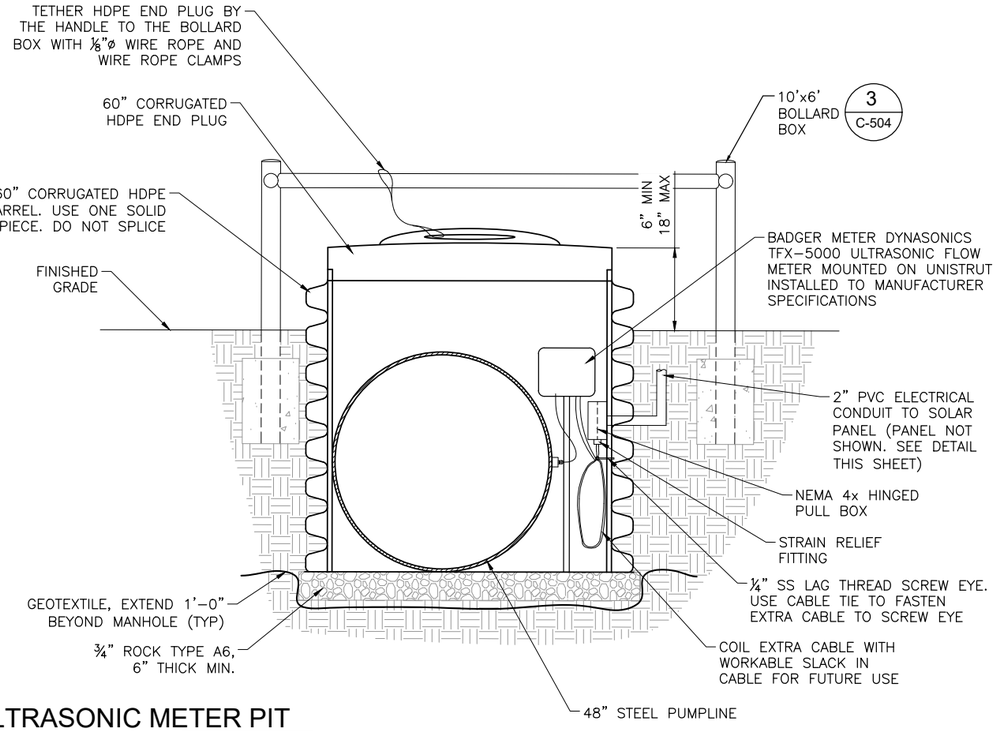
PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

CIVIL DETAILS SHEET 3 OF 5

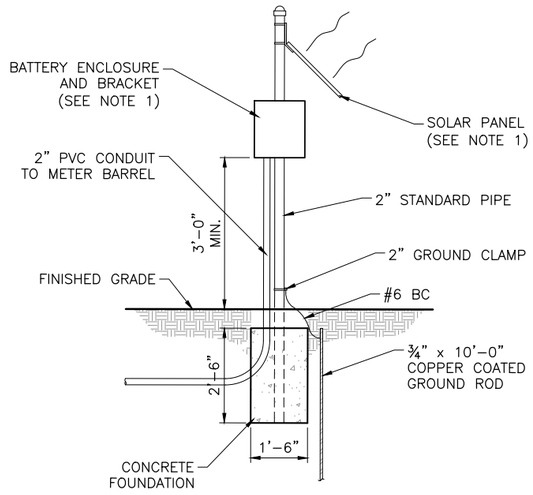
FILE: 81-19-015 PUMPLINE-C-501X
JUB PROJ. #: 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/22/2020

SHEET NUMBER:
C-503

Plot Date:1/23/2020 9:23 AM Plotted By: Erik Snyder
Date Created:1/22/2020 \\81-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CAD\SHEET\CIVIL\81-19-015 PUMPLINE-C-501X.DWG

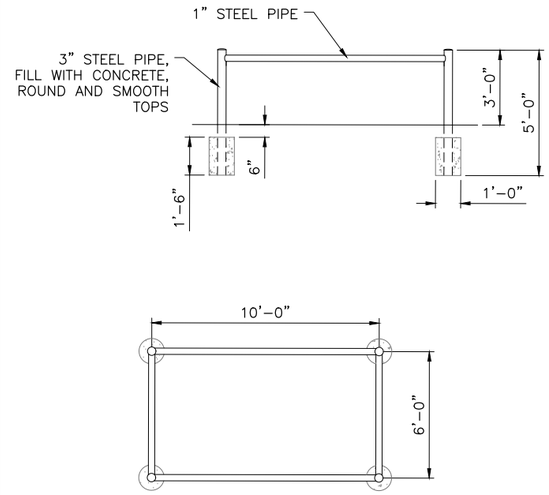


1 ULTRASONIC METER PIT
SCALE: N.T.S.



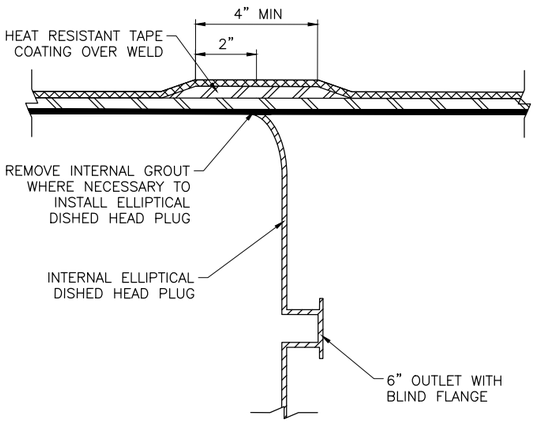
NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR SELECTING APPROPRIATE SOLAR PANEL AND BATTERIES TO POWER METER.

2 SOLAR PANEL DETAIL
SCALE: N.T.S.



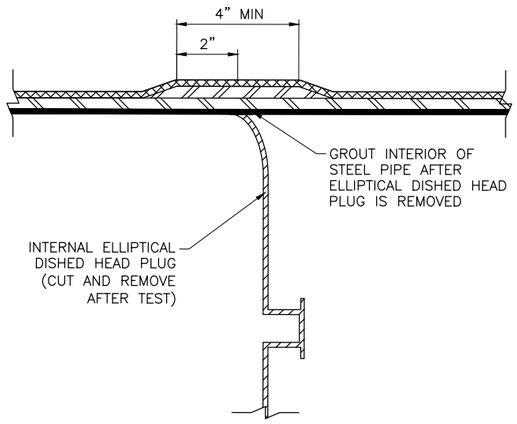
NOTES:
1. BOLLARD BOX TO BE HOT-DIP GALVANIZED AS A SINGLE UNIT PRIOR TO INSTALLATION.
2. TYPICAL FOR OTHER BOLLARD BOX SIZES CALLED OUT IN THE PLANS.

3 10' x 6' BOLLAR BOX
SCALE: N.T.S.



NOTES:
1. DISHED HEAD PLUGS SHALL BE CAPABLE OF WITHSTANDING THE HYDROSTATIC TEST PRESSURE FROM EITHER SIDE, WITH THE OPPOSITE SIDE EMPTY OF WATER

4 DISHED HEAD PLUG INSTALLATION
SCALE: N.T.S.



5 DISHED HEAD PLUG REMOVAL
SCALE: N.T.S.

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	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

CIVIL DETAILS SHEET 4 OF 5

FILE :	81-19-015 PUMPLINE-C-501X
JUB PROJ. # :	81-19-015
DRAWN BY:	MF
DESIGN BY:	EWS
CHECKED BY:	NE

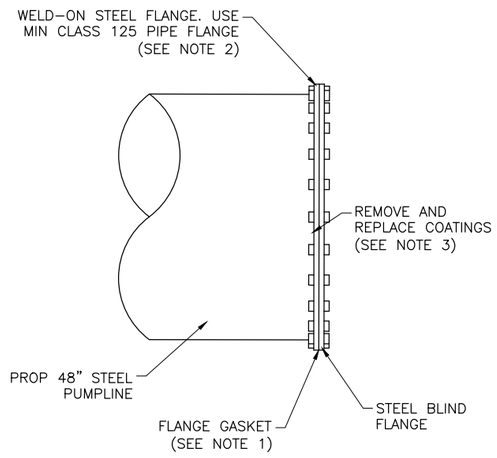
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 1/22/2020

SHEET NUMBER:
C-504

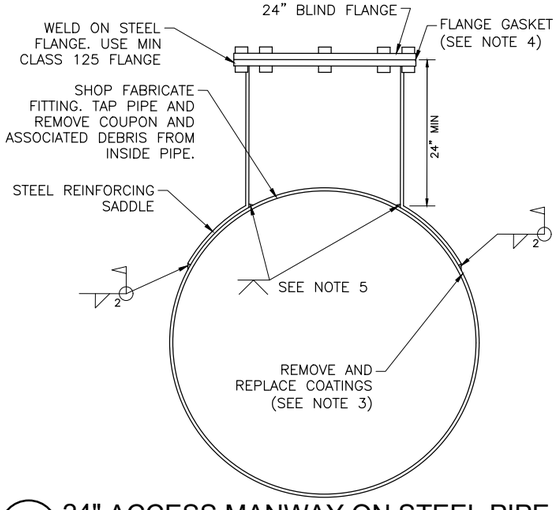
Plot Date:1/22/2020 9:23 AM Plotted By: Erik Snyder
Date Created:1/22/2020 \\b1-PALISADE-GP\JBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CADSHEET\CIVIL\81-19-015 PUMPLINE-C-501X.DWG

BLIND FLANGE NOTES:
1. USE RING TYPE OR FULL–FACE GASKET FOR FLANGED JOINTS. PROVIDE 1/8–INCH THICK CLOTH INSERTED RUBBER GASKET MATERIAL IN ACCORDANCE WITH AWWA C207. CUT GASKETS AT FACTORY FOR PROPER DIMENSIONS.
2. MATCH STEEL WELD–ON FLANGE BOLT PATTERN TO CONNECTED FLANGE.
3. REPAIR COATING AS PER MANUFACTURERS RECOMMENDATIONS FOR APPROVED COATING SYSTEM.

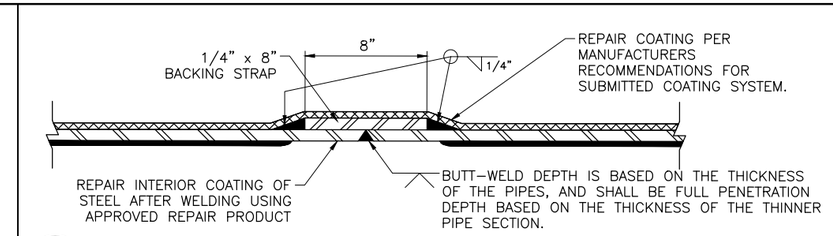


1 PROPOSED 48" BLIND FLANGE
SCALE: N.T.S.

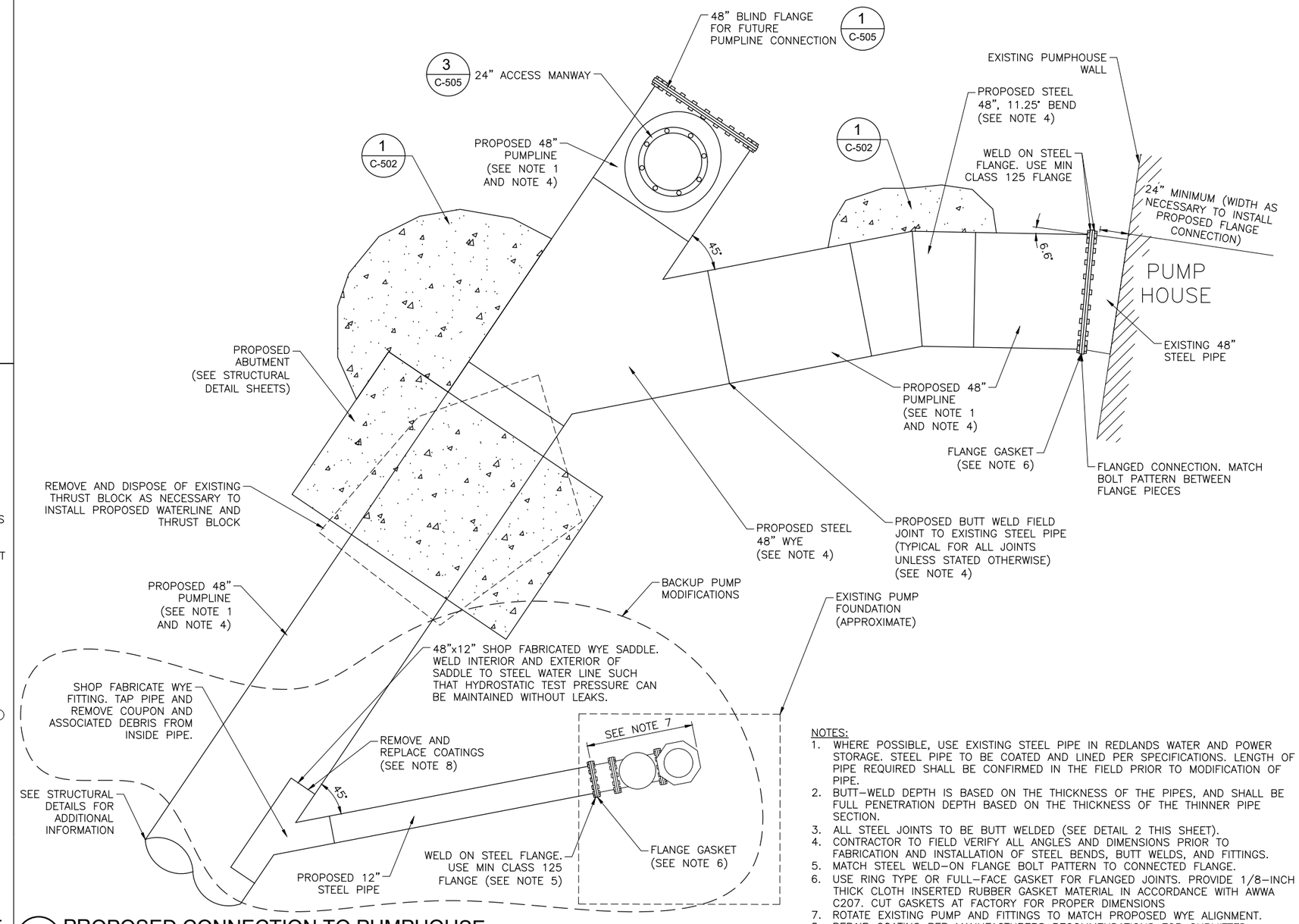
ACCESS MANWAY NOTES:
1. SHOP FABRICATE STEEL FITTING.
2. WELD INTERIOR AND EXTERIOR OF SADDLE TO STEEL WATER LINE SUCH THAT HYDROSTATIC TEST PRESSURE CAN BE MAINTAINED WITHOUT LEAKS.
3. REPAIR COATING AS PER MANUFACTURERS RECOMMENDATIONS FOR APPROVED COATING SYSTEM.
4. USE RING TYPE OR FULL–FACE GASKET FOR FLANGED JOINTS. PROVIDE 1/8–INCH THICK CLOTH INSERTED RUBBER GASKET MATERIAL IN ACCORDANCE WITH AWWA C207. CUT GASKETS AT FACTORY FOR PROPER DIMENSIONS
5. BUTT–WELD DEPTH IS BASED ON THE THICKNESS OF THE PIPES, AND SHALL BE FULL PENETRATION DEPTH BASED ON THE THICKNESS OF THE THINNER PIPE SECTION.



3 24" ACCESS MANWAY ON STEEL PIPE
SCALE: N.T.S.



2 BUTT WELD FIELD JOINT FOR STEEL PIPE
SCALE: N.T.S.



4 PROPOSED CONNECTION TO PUMPHOUSE
SCALE: N.T.S.

NOTES:
1. WHERE POSSIBLE, USE EXISTING STEEL PIPE IN REDLANDS WATER AND POWER STORAGE. STEEL PIPE TO BE COATED AND LINED PER SPECIFICATIONS. LENGTH OF PIPE REQUIRED SHALL BE CONFIRMED IN THE FIELD PRIOR TO MODIFICATION OF PIPE.
2. BUTT–WELD DEPTH IS BASED ON THE THICKNESS OF THE PIPES, AND SHALL BE FULL PENETRATION DEPTH BASED ON THE THICKNESS OF THE THINNER PIPE SECTION.
3. ALL STEEL JOINTS TO BE BUTT WELDED (SEE DETAIL 2 THIS SHEET).
4. CONTRACTOR TO FIELD VERIFY ALL ANGLES AND DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION OF STEEL BENDS, BUTT WELDS, AND FITTINGS.
5. MATCH STEEL WELD–ON FLANGE BOLT PATTERN TO CONNECTED FLANGE.
6. USE RING TYPE OR FULL–FACE GASKET FOR FLANGED JOINTS. PROVIDE 1/8–INCH THICK CLOTH INSERTED RUBBER GASKET MATERIAL IN ACCORDANCE WITH AWWA C207. CUT GASKETS AT FACTORY FOR PROPER DIMENSIONS
7. ROTATE EXISTING PUMP AND FITTINGS TO MATCH PROPOSED WYE ALIGNMENT.
8. REPAIR COATING PER MANUFACTURERS RECOMMENDATIONS FOR SUBMITTED COATING SYSTEM.
9. NUTS AND BOLTS SHALL BE 308 STAINLESS STEEL.

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PRELIMINARY PLANS

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REVISION				

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

CIVIL DETAILS SHEET 5 OF 5

FILE: 81-19-015 PUMPLINE-C-501X
JUB PROJ. # : 81-19-015
DRAWN BY: MF
DESIGN BY: EWS
CHECKED BY: NE
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/22/2020

SHEET NUMBER:
C-505

Plot Date:1/23/2020 9:23 AM Plotted By: Erik Snyder
Date Created:1/22/2020 \\81-PALISADE-01\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CAD\SHEET\CIVIL\81-19-015 PUMPLINE-C-501X.DWG

GENERAL STRUCTURAL NOTES & SPECIFICATIONS

1. GENERAL

A. These general structural notes and specifications supplement the project written technical specifications and the project structural drawings.
B. The Contractor is responsible for all construction bracing, temporary shoring, and other site safety controls required during construction in accordance with all applicable Local, State and Federal regulations, to insure the stability and safety of all construction until it is completed and self–supporting.
C. The Contractor is responsible for all water, both above and below ground, runoff and other environmental controls required during construction to insure the site is maintained in compliance with all applicable Local, State and Federal regulations.
D. Details on these plans are intended to depict the general construction details and methods for this structure. Connection details and conditions not specifically shown that are similar in nature to those that are specified shall be assumed one and the same. If questions regarding the application of details are encountered, notify the Engineer for clarification or instruction.
E. Prior to implementing any changes to these plans, the Engineer shall be notified in writing for their written approval. Changes implemented without the Engineers written approval shall relieve the Engineer of any claim or liability resulting from that portion of the structure changed or affected by the change.

2. CONTRACTOR RESPONSIBILITY FOR COORDINATION

A. It is the Contractors Prime responsibility to coordinate the work shown on all of the Project Drawings, general, special and technical specifications.
B. The Contractor is responsible to verify all existing construction material types dimensions, elevations and conditions.
C. The Contractor shall verify and coordinate the dimensions among all drawings and in the field prior to proceeding with any work or fabrication, any discrepancy shall be immediately reported to the Engineer.
D. It is the Contractor's responsibility to carefully study and coordinate the construction requirements shown on Civil and Structural Drawings. When conflicts or discrepancies are found between these plan sets and/or within these drawings, the Contractor shall report them immediately to the project Engineer for direction and/or clarification.
E. Any construction work done by the Contractor before obtaining such clarification from the Project Engineer shall be at the Contractor's own risk and cost. Furthermore; any work required to correct, replace and/or restore the work as directed by the Engineer shall be at the Contractor's own risk and cost.

3. CODES

A. Unless otherwise noted, all referenced building codes and standards refer to their current editions, including any local, state, or federal amendments or changes, as adopted in the locality of the Project on the date these drawings are signed and sealed by the Project Engineer.
B. General:
   a. International Code Council, ICC, International Building Code, IBC.
   b. Minimum Design Loads for Buildings and Other Structures, ASCE 7.
C. Concrete:
   a. American Concrete Institute, ACI 301, Specifications for Structural Concrete.
   b. American Concrete Institute, ACI 318, Building Code Requirements for Structural Concrete.
   c. American Concrete Institute, ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
D. Steel:
   a. American Institute of Steel Construction, Steel Construction Manual.
   b. American Welding Society, AWS D1.1, Structural Welding Code.

4. DESIGN CRITERIA.

A. OCCUPANCY OR USE; IBC Table 1607.1: Walkway/Elevated Platform
B. OCCUPANCY CATEGORY; U
C. RISK CATEGORY; ASCE Table 1.5–2 I
D. LIVE LOAD:
   a. Floor: 100 psf or 300 lb concentrated load
E. SNOW LOAD:
   a. Ground Snow Load: 30 psf
   b. Snow Importance Factor: 0.80
   c. Snow Exposure Factor: 0.90
   d. Thermal Factor: 1.20
F. WIND:
   a. Ultimate Wind Speed: 98 mph
   b. Site Exposure: C
G. SOIL LOAD:
   a. Saturated Soil Density: 130 pcf
   b. Active Lateral Equivalent Fluid Pressure: 45 psf/ft.
   c. Passive Lateral Equivalent Fluid Pressure: 250 psf/ft.

5. SPECIAL INSPECTIONS. Special Inspections per IBC Chapter 17 are required for the following items: C indicates Continuous, P indicates Periodic.

A. Soils.	By Geotechnical Engineer.	Frequency
d.	Site preparation:	P
e.	Fill material verification:	C
f.	Fill placement and compaction:	C
g.	Lift thickness:	C
B. Concrete.		
a.	Reinforcement placement:	P
b.	Reinforcing welding:	Refer to Steel Welding Requirements.
c.	Placement of cast–in–place anchors:	P
d.	Verification of use of required mix:	P
e.	Concrete placement:	C
f.	Verification of in–situ concrete prior to removal of forms and	
C. Post Installed Concrete Anchors.		
a.	Installation:	C
D. Structural steel.		
a.	Fabrication of structural elements:	P
b.	Material verification of structural steel:	P
c.	Material verification of high strength bolts:	P
d.	Material verification of anchor bolts & threaded rods:	P
e.	Material verification of weld filler materials:	P
f.	Verify use of proper WPS'S:	P
g.	Complete and partial penetration groove welds:	C
h.	Multi–pass fillet welds:	C
i.	Single–pass fillet welds greater than 5⁄16":	C
j.	Single–pass fillet welds less than or equal to 5⁄16":	P
k.	Welding stair and railing systems:	P
l.	Snug–tight high strength bolt installation:	P

   m. Welding performed in the shop of an Approved Fabricator shall not require Special Inspection.
   n. Special Inspector shall submit a final report to the local building official detailing the results of all structural steel inspections prior to final building inspection.
E. All special inspection shall be performed by certified inspectors.

6. SUBMITTALS.

A. Submit required copies, one (1) electronic .pdf file or three (3) minimum hardcopy, of product or material design information to the Engineer for review for the following items:
   a. Concrete mix designs and admixtures.
   b. Non–shrink grout.
   c. Expansion bolts.
   d. Epoxy Anchors.
   e. Concrete Anchors.
   f. Certifications of welders.
B. The following items to be designed by others are considered "Deferred Submittals". Deferred submittals shall be accompanied by design drawings, shop drawings and structural calculations, stamped and signed by a Professional Structural Engineer currently registered in the State of Colorado.
   a. Precast cradle beams and abutments.
C. Submit required copies of shop drawings, one (1) electronic .pdf file or three (3) minimum hardcopy, to the Engineer for review prior to fabrication of the following items:
   a. Reinforcing steel for all concrete.
   b. Miscellaneous steel fabrications including railings, bar–grating, brackets, and plates.

7. WELDING OF STRUCTURAL STEEL.

A. All welding shall conform to the requirements of the current AWS Structural Welding Code D1.1–02
B. Weld Metal: Fexx=70 ksi, typical unless otherwise noted or required by AWS.
C. All welders shall be tested and certified by an independent testing agency.
D. Qualification of welders shall be in accordance with the Specifications for Standard Qualification Procedure of the AWS.

8. FOUNDATIONS.

A. All footings to be placed on firm undisturbed, inorganic material. Proof roll sub–grade prior to placing concrete where the material has been disturbed by the excavating equipment.
B. Allowable bearing pressure for all footings Qa = 1,000 psf
C. Local areas of soft and/or unacceptable material encountered at bottom of footing elevations indicated on the plans must be over–excavated and brought up to design grade with compacted "structural fill" or "lean concrete fill".
D. All structural fill and/or backfill shall be granular, free draining, material; Unified Soils Classification GW, GP, GM or SW; maximum aggregate size of 3–in. and no more than 7% passing a number 200 sieve. Material shall be placed in lifts no greater than 6–in. in depth and compacted to 95% of maximum density as determined per ASTM D1557.
E. Design for the mitigation of subsurface water flow and/or perched water tables shall be the responsibility of others.
F. The Engineer shall be notified in writing if any ground water, clay type soils, debris or unconsolidated materials are encountered during excavations for foundations.

9. STRUCTURAL MATERIALS.

A. STRUCTURAL STEEL:
   a. PLATES, BARS, CHANNELS & ANGLES: ASTM A36, Fy=36 ksi.
   b. STEEL PIPE: ASTM A53 Grade B, Fy=35 ksi.
   c. SQUARE, RECTANGULAR HSS, STEEL TUBING: ASTM A500 Grade B, Fy=46 ksi.
B. STRUCTURAL BOLTS: High Strength Bolts shall be ASTM A325, Type 1. Nuts for High Strength Bolts shall conform to ASTM A563, Grade DH, Heavy Hex.
C. ANCHOR RODS: Anchor Rods (bolts set into concrete) shall be ASTM F1554, Fy=36 ksi. Nuts for anchor rods shall conform to ASTM A563, Grade A, Heavy Hex.
D. THREADED STEEL RODS: Threaded steel rods shall conform to ASTM A36, Fy=36 ksi. Nuts for threaded rods shall conform to ASTM A563, Grade A, Heavy Hex.
E. WASHERS: All washers shall conform to ASTM F436.
F. BOLT PLACEMENT: All bolts shall be on member standard gage lines except as noted otherwise.
G. PROJECT CONCRETE MIX TYPES: Concrete shall be proportioned and furnished for the various project uses as indicated on the plans and as follows:
   a. M1: All structural concrete: fc = 4,000 psi, Absolute water–cement ratio by weight = 0.50, Air Content = 6% (+/– 1.5%)
H. CONCRETE MIX COMPONENTS.
   a. A water–reducing admixture conforming to ASTM C494, used in strict conformance with the manufacturer's instructions, shall be incorporated in all concrete mix designs. At Contractor's option, a high–range water–reducing (HRWR) admixture conforming to ASTM C494, Type F or G, may be used provided the total slump is less than 10".
   b. Higher water–cement ratios than shown above may be used if substantiated in accordance with ACI 318.
   c. Fly–ash conforming to ASTM C618 Type F or C, may replace up to 20% of the cement content, provided that the mix strength is substantiated by test data.
   d. Cement: ASTM C150 Type I or II.
   e. Water: Clean & Potable.
   f. Air entraining agent: ASTM C260. Except where noted non–air entrained.
   g. Aggregate: 0.75–inch Maximum aggregate per ASTM C33. Unless noted otherwise.
   h. Mix Proportioning: ACI 211.1 and 350R.
I. CONCRETE ACCESSORIES:
   a. REINFORCING STEEL: Reinforcing steel shall conform to ASTM A615 Grade 60.
   b. REINFORCING STEEL TO BE WELDED: All reinforcing steel to be welded shall conform to ASTM A706 Grade 60, low–alloy, deformed reinforcing steel.
   c. WELDED WIRE FABRIC: ASTM A185 or A497.
   d. WIRE: Plain wire shall conform to ASTM A 82. Deformed wire shall conform to ASTM A 496, and Epoxy coated wire shall conform to ASTM A 884.
   e. JOINTING MATERIALS: In accordance with ACI 350 Section 4.5.2. All jointing materials including water–stops, expansion joints and sealants, shall be resistant to chemical attack for the design life of the facility. Sealants shall conform to ASTM C 920 and Federal Specification TT–S–00277E and PVC Water–stop shall conform to ASTM D 570, ASTM D 746, STM D 1149 and CRD–C572.
J. NON–SHRINK GROUT: All non–shrink grout noted on the plans shall be non–shrink, non–metallic grout with a minimum 28–day compressive strength of 7,000 psi.
K. EXPANSION BOLTS: Bolts noted on the plans as Expansion Bolts shall be HILTI Kwik Bolt–II, stud anchors; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
L. EPOXY SET BOLTS & REBAR: Bolts and reinforcing steel bars noted on the plans as Epoxy or Construction Adhesive Set Bolts or Rebar shall be set in place utilizing the SIMPSON SET High Strength Epoxy system; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
M. HEADED ANCHOR/STUDS: Headed Anchor/studs shall be Nelson headed anchors with fluxed ends or approved conforming to AWS D1.1, Type A headed studs made form ASTM A108, 1010–1020, low–carbon steel. Shear Connector/Studs shall be automatically end–welded with the manufacturers standard equipment in accordance with their recommendations.
N. DEFORMED BAR ANCHORS (DBA): Deformed Bar Anchors shall meet the requirements of AWS D1.1, Deformed Bar Anchors, made form ASTM A496 material with a minimum yield strength of Fy=70 ksi. Deformed Bar Anchors shall be automatically end–welded with the manufacturer's standard equipment in accordance with their recommendations.

10. CONCRETE QUALITY AND DETAILS.

A. GENERAL. Concrete shall be proportioned to provide an average compressive strength, fc, as prescribed in ACI 318/350 and shall satisfy the durability criteria of ACI 318/350.
B. CONCRETE PROPORTIONS.
   a. Concrete mix proportioning shall be in accordance with ACI 211.1; Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
C. CONCRETE MIX VERIFICATION: Concrete mix designs shall be verified by standard 28–day cylinder tests per ASTM C39.
D. EVALUATION AND ACCEPTANCE OF CONCRETE. Concrete shall be tested in accordance with the requirements of ACI 318/350.
E. MIXING & PLACING CONCRETE. Concrete shall be prepared, mixed, placed and consolidated in accordance with ACI 318/350 and as follows:
   a. ACI 304; Guide for Measuring, Mixing, Transporting, and Placing Concrete.
   b. ACI 309; Guide for Consolidation of Concrete.
F. CONCRETE CURING. Concrete shall be maintained above 50–degrees F and in a moist condition for at least 7 days after placement, except when cured in accordance with ACI 318.
   a. Curing of concrete shall be per the recommendations given in ACI 308; Guide to Curing Concrete.

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PRELIMINARY PLANS

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NO.	DESCRIPTION	BY	APP'D	DATE
	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

GENERAL STRUCTURAL NOTES

FILE: 81-19-015_S-001X
JUB PROJ. #: 81-19-015
DRAWN BY: BS/ELC
DESIGN BY: ELC
CHECKED BY: AWB
ONE INCH
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G. COLD WEATHER REQUIREMENTS. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near–freezing weather. The recommended procedures listed in ACI 306; Cold Weather Concreting shall be followed.
   a. Cold weather is defined as a period when, for more than 3 consecutive days, the following conditions exist:
      a.1. The average daily air temperature is less than 40–degrees F and
      a.2. The air temperature is not greater than 50–degrees F for more than one–half of any 24–hour period.

H. HOT WEATHER REQUIREMENTS. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The recommended procedures listed in ACI 305; Hot Weather Concreting shall be followed.
   a. Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:
      a.1. High ambient temperature.
      a.2. High concrete temperature.
      a.3. Low relative humidity.
      a.4. Wind speed.
      a.5. Solar radiation.

11. FORMWORK.

A. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications.
   a. Design of formwork shall be in accordance with ACI 318/350.
   b. Formwork shall be in accordance with ACI 347; Guide to Formwork for Concrete.

B. Tolerances for finished concrete surfaces shall meet the following requirements, class of surface is per Table 3.4:
   a. Footings: Class C
   b. Foundation walls: Class B
   c. Above grade concrete not visible to sight: Class B
   d. Above–grade concrete visible to sight: Class A

C. REMOVAL OF FORMS.
   a. Concrete forms shall not be removed until the retained concrete has reached the following minimum percentage of the required 28 day compressive strength:
      a.1. Footings and base slabs on grade: 50% of f'c.
      a.2. Foundation walls and columns: 67% of f'c.
      a.3. Elevated structural slabs, beams, and joists: 95% of f'c.
   b. Where concrete cylinder tests are not available for strength verification the following guide may be used when permitted by the Project Engineer:
      b.1. Footings and base slabs on grade: 12 hours.
      b.2. Foundation walls and columns: 24 hours.
      b.3. Elevated structural slabs, beams, and joists: By cylinder verification only.

D. EMBEDMENTS IN CONCRETE.
   a. Conduits, pipes, and sleeves of any material not harmful to concrete and within limitations of ACI 318/350 shall be permitted to be embedded in concrete with approval of the Project Engineer, provided they are not considered to replace structurally the displaced concrete, except as provided in ACI 318/350.
   b. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum–concrete reaction or electrolytic action between aluminum and steel.

E. CONSTRUCTION JOINTS.
   a. Construction joints shall only be placed where indicated on the project drawings or as approved by the Project Engineer.
   b. Construction joints shall be constructed in accordance with ACI 318/350.

12. DETAILS OF REINFORCEMENT.

A. Placement of all reinforcing steel within concrete structures shall be in conformance with ACI 318/350.
B. Reinforcing steel hooks, bends, ties, splices and other reinforcement details shall be in accordance with ACI 315; Details and Detailing of Concrete Reinforcement.
C. Spacing limits for reinforcement shall be in conformance with ACI 318/350.
D. Concrete protection for reinforcement. Unless noted elsewhere on the drawings, all reinforcing steel shall have the following concrete cover:
   a. For liquid containing concrete structures; per ACI 350 Section 7.7:
      a.1. Concrete cast against earth: 3.00 inch
      a.2. Concrete exposed to earth, liquid or weather;
         a.2.1. Slabs and joints: 2.00–inch
         a.2.2. Walls: 2.00–inch
      a.3. Beams and columns;
         a.3.1. Ties, stirrups or spirals: 2.00–inch
         a.3.2. Primary reinforcement: 2.50–inch
      a.4. Footings and base slabs;
         a.4.1. Formed surfaces: 2.00–inch
         a.4.2. Top of footings and base slabs: 2.00–inch
E. Concrete blocks or plastic–coated bar chairs shall be provided for support of all slab reinforcing steel, sufficient in number to prevent settlement or sagging, but in no case shall such support be continuous. Metal clips or supports shall not be placed in contact with the forms or the sub–grade.
F. Dowels and anchor bolts shall be wired or otherwise held in correct position prior to placing concrete. Care shall be taken to insure that dowels and anchor bolts remain plum after concrete is poured and vibrated. In no case shall dowels or anchor bolts be stabbed into freshly poured concrete.
G. Provide dowels in footings and at construction joints to match vertical reinforcing bar size and spacing, unless otherwise noted on the drawings.
H. Where drilled in anchors are to be post–installed into concrete surfaces take care to locate reinforcing steel so that it will not interfere with the drilling operations. Move bars plus or minus 1 to 2 inches in order to avoid drilling conflicts.
I. All bar bends, hooks, splices and other reinforcing steel details shall conform to the requirements of ACI 315.
J. Unless otherwise noted on the plans all bars shall be spliced with a minimum Class B lap splice.
K. At all corners and wall intersections provide bent bars to match the horizontal reinforcing steel and in accordance with the typical corner reinforcing details.
L. Chamfer all exposed corners and fillet entrant angles 3/4□unless otherwise noted on the drawings.
M. WATERSTOP. All control and construction joints in liquid–retaining structures shall be doweled, keyed and provided with continuous water–stop, per the typical details, technical specifications or as directed by the Project Engineer.
N. At slab and wall openings provide a minimum of (4) #5 bars; over, under and at either side of the openings. Extend these bars a minimum of 24□past the opening edge. Provide (1) matt of (4) #5 bars for walls or slabs with single–layer reinforcing and (2) matts of (4) #5 bars for double–layer reinforcing walls or slabs. Provide #4, 4'–0□long diagonal bars at each re–entrant corner in slabs; (1) bar for slabs with single layer reinforcing and (2) bars for slabs with double layer reinforcing.

13. CONCRETE FINISHING. All concrete surfaces shall be finished in accordance with ACI 301.

A. Formed Concrete Surfaces. After removal of forms, give each formed surface one or more of the following finishes:
   a. Liquid Retaining Concrete Structures:
      a.1. Interior surfaces from top of wall to floor slab, exterior and top surfaces exposed to view to 6–inches below grade. Provide a Grout–cleaned finish per ACI 301 Section 5.3.3.4.b.
      a.2. Surfaces below grade and not exposed to view. Provide a Smooth–rubbed finish per ACI 301 Section 5.3.3.4.a.
B. Unformed Concrete Surfaces. Unformed concrete surfaces including the top surface of all concrete floor slabs shall be finished in accordance with ACI 301 Section 5.3.4 and ACI 302 Chapter 8.
   a. For the top surfaces of walls, provide a Scratched finish per Section 5.3.4.2.a.
   b. Provide a Nonslip finish for exterior surfaces and where indicated on the plans.
C. Sawed contraction joints. Conform to ACI 301 Section 5.3.5.

14. CONCRETE FLOORS AND SLABS.

A. Concrete floors and slabs shall be constructed in accordance with ACI 302; Concrete Floor and Slab Construction. Provide the following Class Concrete floor slabs in accordance with Table 2.1 unless otherwise noted on the drawings:
   a. Exterior structural floor slabs subject to foot and maintenance traffic loads: Class 4 or 5 floor. Provide a Nonslip finish to all walking surfaces.
B. Placing, Consolidating, and Finishing. Follow the recommendations given in Chapter 8.

15. WATER–RETAINING CONCRETE STRUCTURES:

A. Concrete tanks, vaults, wells and other structures intended to retain and hold water or other liquids shall be water–tight structures. The water–resisting walls and floor slabs shall be of monolithic concrete construction with water–tight joints, constructed as indicated on the plans or as directed by the Project Engineer. Water–resisting walls and floors shall be uniform in finished construction free of spalls, pockets, blemishes and or cracks that may weep or leak.
B. Cracks found in water–resisting walls, floors and/or foundation slabs that may weep or leak shall be repaired and/or sealed per the Project Specifications, notes or as approved by the project engineer.

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PRELIMINARY PLANS

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NO.	DESCRIPTION	BY	APP.	DATE
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PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

GENERAL STRUCTURAL NOTES

FILE : 81-19-015_S-001X
JUB PROJ. # : 81-19-015
DRAWN BY: BS/ELC
DESIGN BY: ELC
CHECKED BY: AWB
ONE INCH
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SHEET NUMBER:
S-002

Plot Date:1/22/2020 9:23 AM Plotted By: Erik Snyder
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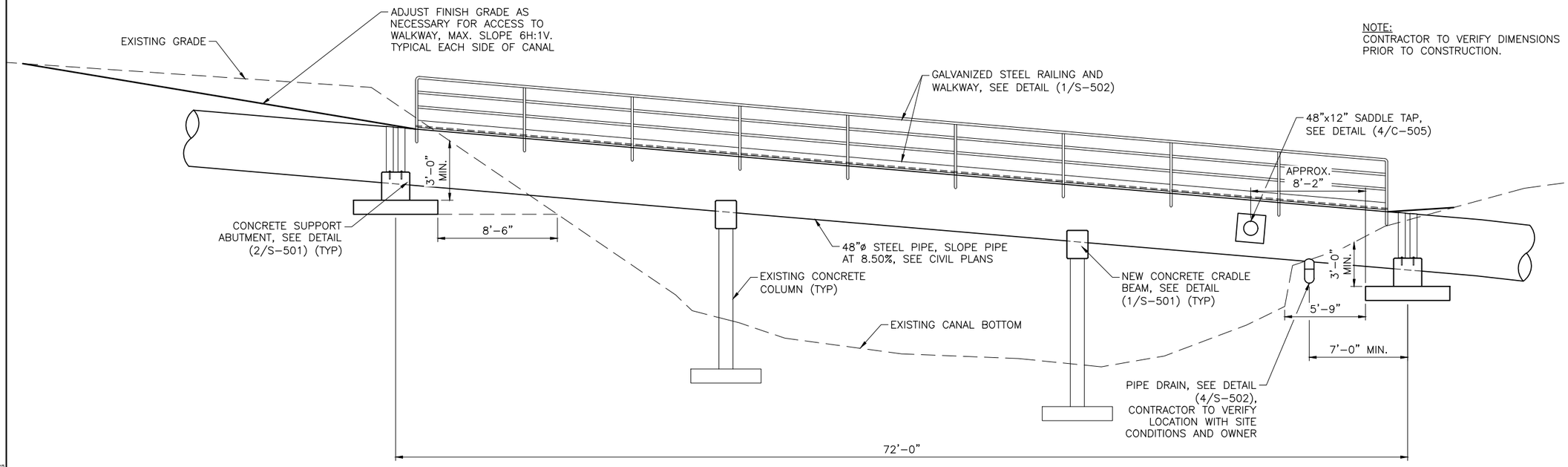
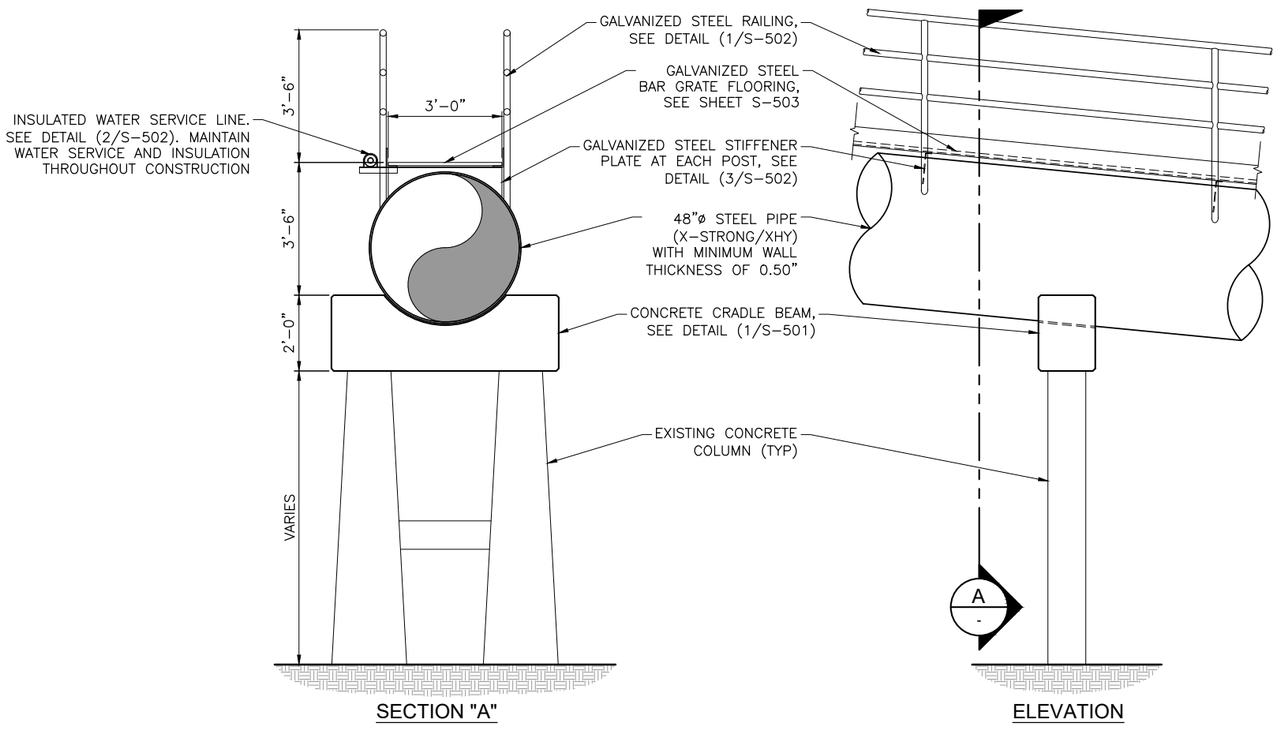


1 WATER LINE CANAL CROSSING ELEVATION
SCALE:NOT TO SCALE



2 TYPICAL PIPE SECTION AND ELEVATION AT EXISTING COLUMNS
SCALE:NOT TO SCALE

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PUMPLINE REPLACEMENT PROJECT
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WATERLINE CANAL CROSSING PLAN

FILE: 81-19-015_CROSSING_S-101X
JUB PROJ. # : 81-19-015
DRAWN BY: BS/ELC
DESIGN BY: ELC
CHECKED BY: AWB
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LAST UPDATED: 1/13/2020

SHEET NUMBER:
S-101

Plot Date:1/23/2020 9:24 AM Plotted By: Erik Snyder
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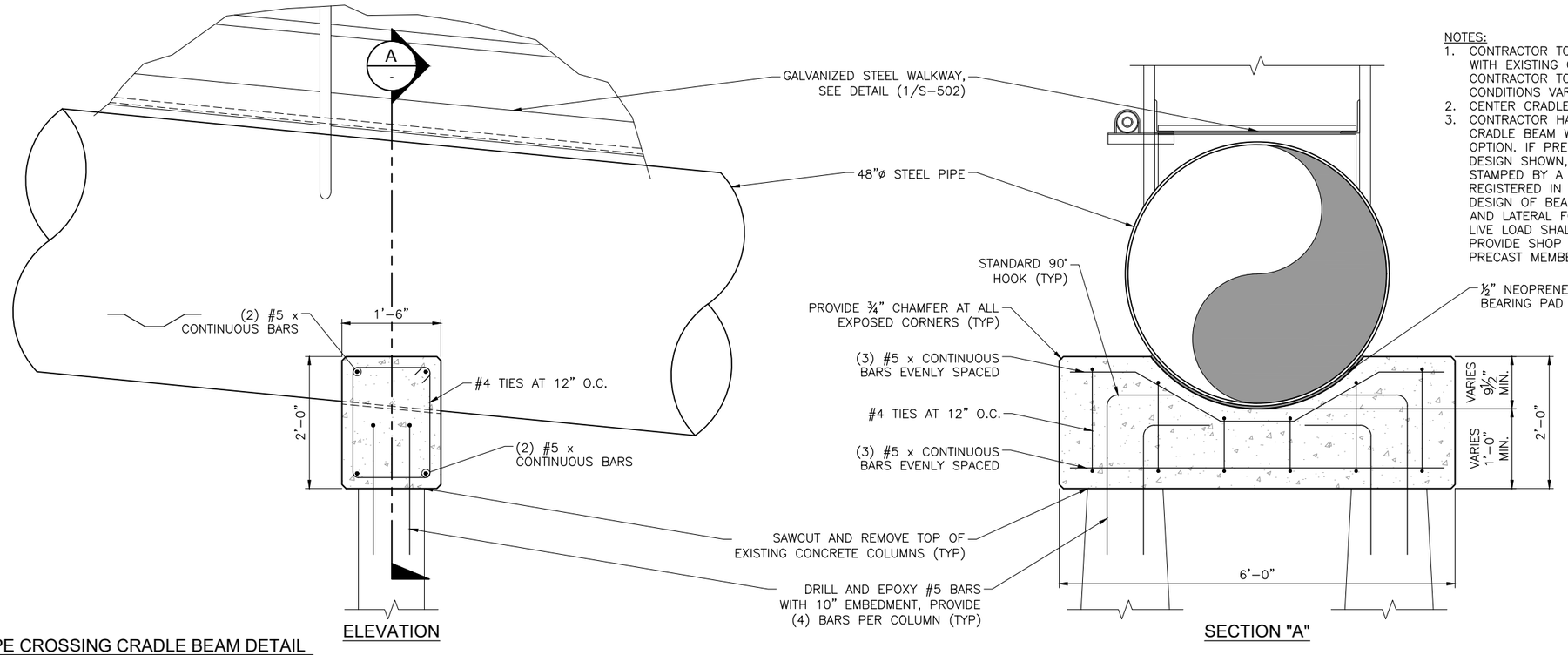
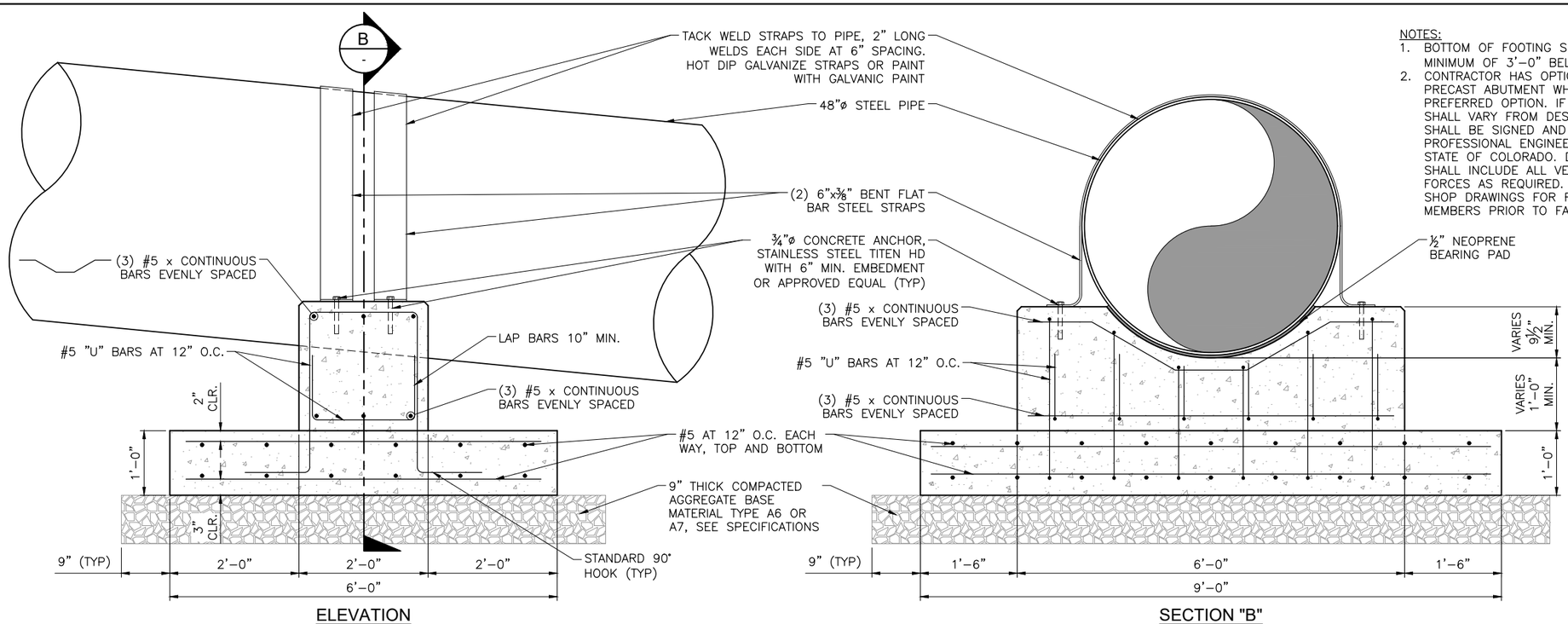


NOTES:
1. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS WITH EXISTING CONCRETE COLUMNS. CONTRACTOR TO NOTIFY ENGINEER IF EXISTING CONDITIONS VARY FROM THAT WHICH IS SHOWN.
2. CENTER CRADLE BEAM ON EXISTING COLUMNS.
3. CONTRACTOR HAS OPTION TO PROVIDED PRECAST CRADLE BEAM WHICH IS THE OWNER PREFERRED OPTION. IF PRECAST BEAM SHALL VARY FROM DESIGN SHOWN, DESIGN SHALL BE SIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO. DESIGN OF BEAM SHALL INCLUDE ALL VERTICAL AND LATERAL FORCES AS REQUIRED. WALKWAY LIVE LOAD SHALL BE 100 PSF. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW FOR PRECAST MEMBERS PRIOR TO FABRICATION.

1 TYPICAL PIPE CROSSING CRADLE BEAM DETAIL
SCALE:NOT TO SCALE



NOTES:
1. BOTTOM OF FOOTING SHALL BE SET AT A MINIMUM OF 3'-0" BELOW FINISH GRADE.
2. CONTRACTOR HAS OPTION TO PROVIDED PRECAST ABUTMENT WHICH IS THE OWNER PREFERRED OPTION. IF PRECAST ABUTMENT SHALL VARY FROM DESIGN SHOWN, DESIGN SHALL BE SIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO. DESIGN OF ABUTMENT SHALL INCLUDE ALL VERTICAL AND LATERAL FORCES AS REQUIRED. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW FOR PRECAST MEMBERS PRIOR TO FABRICATION.

2 TYPICAL PIPE CROSSING ABUTMENT DETAIL
SCALE:NOT TO SCALE

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PRELIMINARY PLANS

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	REVISION			

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

TYPICAL WATERLINE CANAL CROSSING SUPPORT DETAILS

FILE: 81-19-015_CROSSING_S-101X
JUB PROJ. #: 81-19-015
DRAWN BY: BS/ELC
DESIGN BY: ELC
CHECKED BY: AWB
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 1/13/2020

SHEET NUMBER:
S-501

Plot Date:1/23/2020 9:24 AM Plotted By: Erik Snyder
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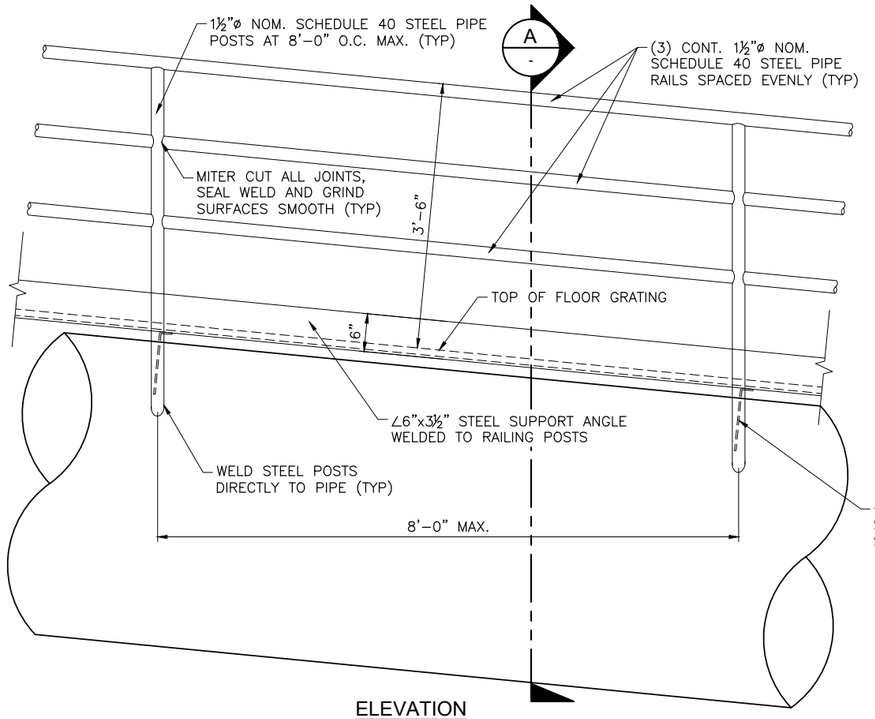
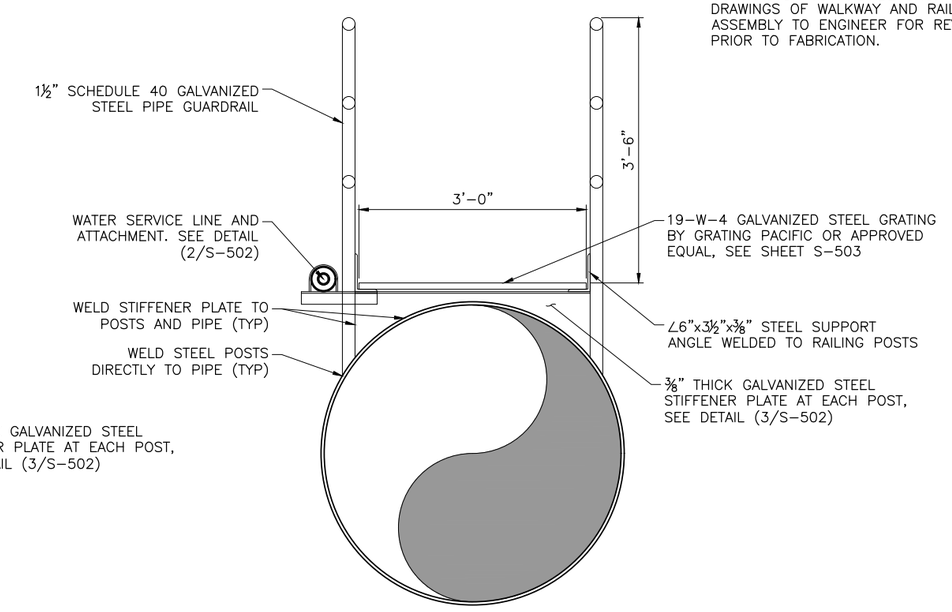


ELEVATION

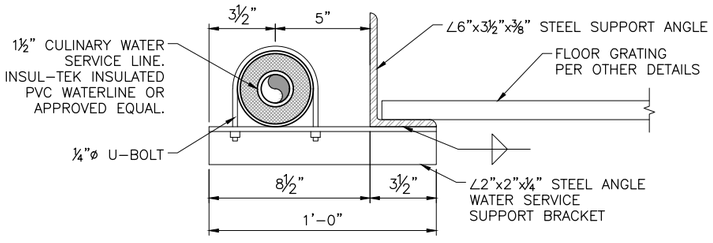


SECTION "A"

NOTE:
CONTRACTOR TO PROVIDE SHOP DRAWINGS OF WALKWAY AND RAILING ASSEMBLY TO ENGINEER FOR REVIEW PRIOR TO FABRICATION.

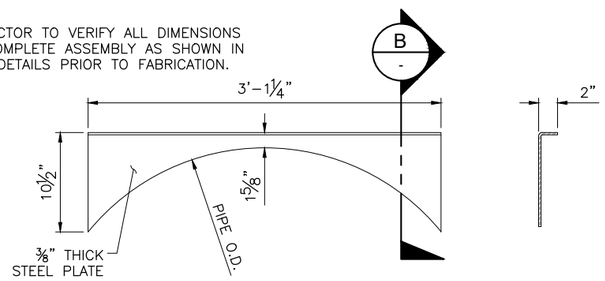
1 TYPICAL PIPE CROSSING WALKWAY AND RAILING DETAIL
SCALE:NOT TO SCALE

NOTE:
WATER SERVICE SUPPORT BRACKETS SHALL BE SPACED AT NO MORE THAN 48" O.C. MAX.



2 TYPICAL WATER SERVICE ATTACHMENT DETAIL
SCALE:NOT TO SCALE

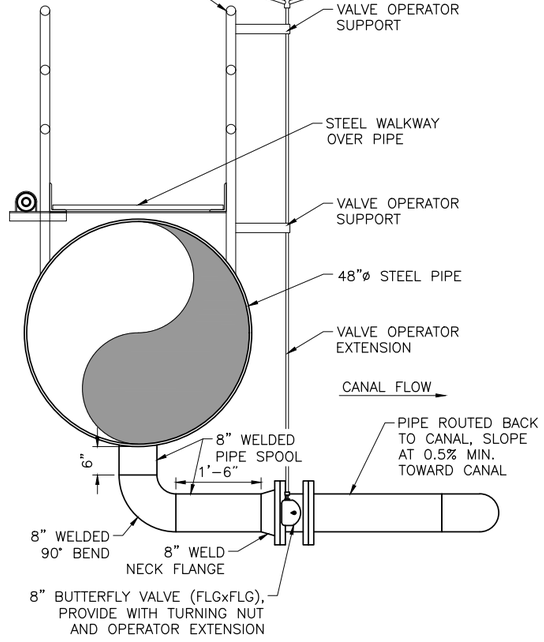
NOTE:
CONTRACTOR TO VERIFY ALL DIMENSIONS WITH COMPLETE ASSEMBLY AS SHOWN IN OTHER DETAILS PRIOR TO FABRICATION.



ELEVATION

SECTION "B"

3 TYPICAL STIFFENER PLATE DETAIL
SCALE:NOT TO SCALE



4 TYPICAL PIPE DRAIN DETAIL
SCALE:NOT TO SCALE

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PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

TYPICAL CANAL CROSSING WALKWAY AND RAILING DETAILS

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SHEET NUMBER:
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GENERAL CONSTRUCTION NOTES FOR STEEL RAILING, STAIRWAYS, GRATING, AND MISCELLANEOUS FABRICATIONS

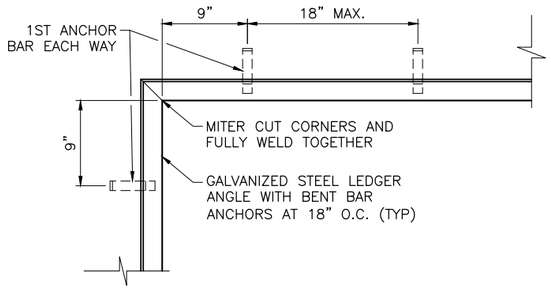
1. STEEL PIPE TO BE ASTM A53 GRADE B STEEL WITH Fy = 35 KSI
2. STEEL BAR, ROD, PLATE, CHANNELS, AND ANGLES TO BE ASTM A36 STEEL WITH Fy = 36 KSI
3. ALL WELDING TO CONFORM TO CURRENT AWS D1.1 REQUIREMENTS.
4. COMPLETE ASSEMBLY OR SUB-ASSEMBLIES, BRACKETS, RAILINGS, AND MISCELLANEOUS STEEL PIECES SHALL BE HOT-DIP GALVANIZED OR PAINTED AS NOTED ON PLANS AFTER FABRICATION.
5. STRUCTURAL BOLTS, NUTS, AND WASHERS SHALL BE HOT-DIP GALVANIZED OR STAINLESS STEEL.
6. EXPANSION ANCHORS TO BE HILTI KWIK-BOLT II OR APPROVED EQUAL. INSTALL EXPANSION ANCHORS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. EXPANSION ANCHOR BOLTS, NUTS & WASHERS SHALL BE STAINLESS STEEL.
8. EPOXY SET ANCHORS SHALL UTILIZE HILTI HIT HY 150 CONSTRUCTION ADHESIVE AND HAS GALVANIZED OR STANLESS STEEL THREAD RODS.
9. REFER TO OTHER DETAILS FOR CONCRETE REINFORCING REQUIREMENTS.
10. COORDINATE PLACEMENT OF REINFORCING AND ANCHOR BOLTS IN CONCRETE TO NOT CONFLICT WITH ONE ANOTHER.
11. FIELD SPLICES SHALL BE MADE UTILIZING STEEL PIPE SLEEVE INSERTS AND HOT-DIP GALVANIZED STEEL BOLTS, NUTS & WASHERS.
12. GALVANIZED AREAS THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH AN APPROVED COLD-GALVANIZING COMPOUND AND APPROVED PAINT.
13. PAINTED AREAS THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH AN APPROVED PAINT.
14. PAINT COLORS SHALL BE APPROVED BY OWNER FOR INDIVIDUAL ITEMS. SUBMIT COLOR SAMPLES TO OWNER FOR APPROVAL PRIOR TO FABRICATION.
15. CROSS REFERENCE ASSOCIATED STANDARD DETAILS AS NECESSARY FOR STEEL FABRICATIONS.

1 CONSTRUCTION NOTES FOR STEEL FABRICATIONS
SCALE:NOT TO SCALE

GRATE SPAN	BEARING BAR SIZE	
S	D	T
UP TO 2'-0"	¾"	⅛"
2'-1" TO 3'-0"	1"	3/16"
3'-1" TO 4'-0"	1¼"	3/16"
4'-1" TO 5'-0"	1½"	3/16"
5'-1" TO 6'-0"	1¾"	3/16"
6'-1" TO 7'-0"	2"	3/16"
7'-1" TO 8'-0"	2¼"	3/16"

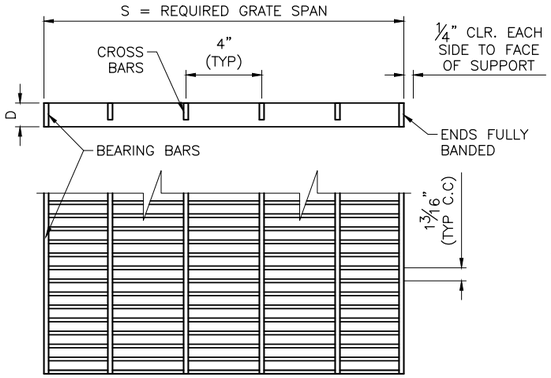
NOTE:
BAR GRATE SHALL SUPPORT A MINIMUM LIVE LOAD OF 100 PSF UNIFORM LOAD AND 300-LB CONCENTRATED LOAD FOR GALVANIZED STEEL WITH AN ALLOWABLE BENDING STRESS OF 18 KSI FOR 1 3/16" CENTER TO CENTER BAR SPACING, TYPICAL. REFER TO TYPICAL GALVANIZED STEEL BAR GRATE DETAIL.

2 TYPICAL GALVANIZED STEEL BAR GRATE SCHEDULE
SCALE:NOT TO SCALE



NOTE:
1. REFER TO GENERAL GALVANIZED STEEL BAR GRATE FLOOR CONSTRUCTION NOTES.
2. SET TOP OF EMBEDMENT ANGLE LEVEL WITH ADJACENT CONCRETE SURFACES.

3 TYPICAL BAR GRATE EMBEDDED LEDGER CORNER DETAIL
SCALE:NOT TO SCALE

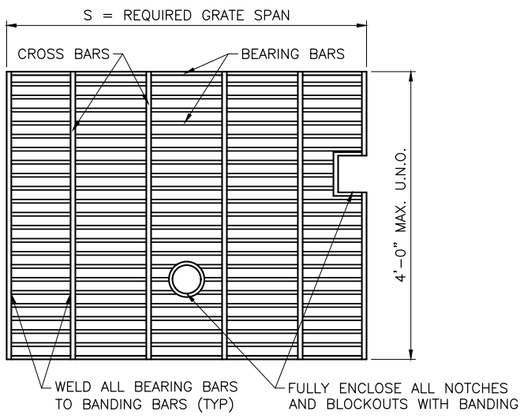


NOTES:

BAR GRATE TYPE:	GW (PER McNICHOLS COMPANY)
BEARING BARS:	"D" DEEP BY "T" THIICK
CROSS BARS:	WELDED OR PRESS-LOCKED
MATERIAL:	HOT-DIP GALVANIZED STEEL
FINISH:	MILL FINISH
WIDTH:	REFER TO FLOOR PLANS
SPAN:	REFER TO FLOOR PLANS
DEPTH, D: SCHEDULE	PER GALVANIZED STEEL BAR GRATE

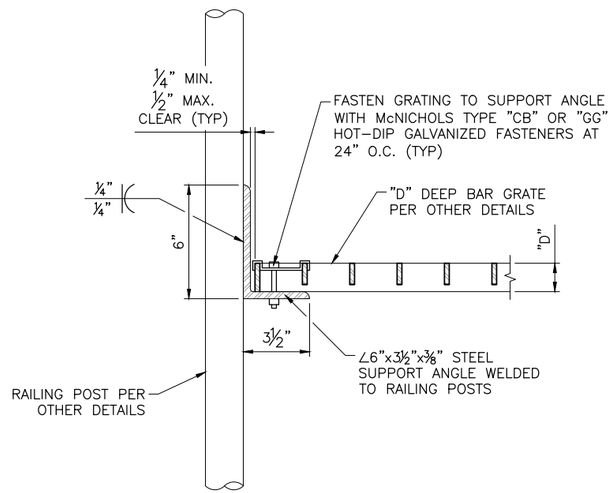
**FURNISH BAR GRATE IN SECTIONS NOT TO EXCEED 4'-0" IN LENGTH AND/OR 200 LBS PER SECTION UNLESS OTHERWISE NOTED.

4 TYPICAL GALVANIZED STEEL BAR GRATE DETAIL
SCALE:NOT TO SCALE



NOTES:
1. REFER TO OTHER TYPICAL DETAILS FOR ADDITIONAL REQUIREMENTS.
2. REFER TO PLAN VIEWS FOR LOCATION OF OPENINGS AND NOTCHES.
3. ALL MATERIALS TO BE HOT-DIP GALVANIZED AFTER FABRICATION.

5 TYPICAL BAR GRATE FLOOR OPENING/NOTCH DETAIL
SCALE:NOT TO SCALE



6 TYPICAL BAR GRATE POST-MOUNT LEDGER SUPPORT DETAIL
SCALE:NOT TO SCALE

J-U-B ENGINEERS, INC.
J-U-B ENGINEERS, INC.
305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	DATE	BY APPR.
	REVISION		

PUMPLINE REPLACEMENT PROJECT
REDLANDS WATER AND POWER

TYPICAL GALVANIZED STEEL GRATING DETAILS

FILE :	81-19-015_CROSSING_S-101X
JUB PROJ. # :	81-19-015
DRAWN BY:	BS/ELC
DESIGN BY:	ELC
CHECKED BY:	AWB

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 1/13/2020

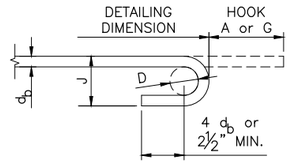
SHEET NUMBER:
S-503

Plot Date:1/22/2020 9:24 AM Plotted By: Erik Snyder
Date Created:1/13/2020 \\81-PALISADE-G\PUBLIC\PROJECTS\JUB\REDLANDS WATER AND POWER\RWP GENERAL SVS 81-19-015\PUMPLINE REPLACEMENT DESIGN\CAD\SHEETS\STRUCTURAL\81-19-015_CROSSING_S-101X.DWG

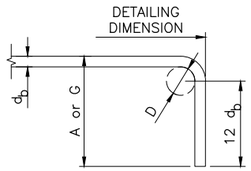
TYPICAL LAP SPLICE LENGTHS IN INCHES, PER ACI 350									
BAR SIZE	LAP CLASS	f'c=3,000 psi		f'c=4,000 psi		f'c=4,500 psi		f'c=5,000 psi	
		CAT. 1	CAT. 2	CAT.1	CAT. 2	CAT. 1	CAT. 2	CAT. 1	CAT. 2
#4	A	22	33	19	28	18	27	17	25
	B	28	43	25	37	24	35	22	33
#5	A	27	41	24	36	23	34	21	32
	B	36	53	31	46	30	44	28	41
#6	A	33	49	28	43	27	41	25	38
	B	43	64	37	55	36	53	33	50
#7	A	48	72	42	62	40	59	37	56
	B	62	93	54	81	51	77	48	72
#8	A	55	82	47	71	45	68	42	64
	B	71	106	61	92	58	88	55	83
#9	A	62	92	53	80	51	76	48	72
	B	80	120	69	104	66	99	62	93

NOTES:
1. FOR GRADE 60 REINFORCING STEEL BARS.
2. ALL LAP SPLICES SHALL BE CLASS B, UNLESS NOTED OTHERWISE.
3. CATEGORY 1: CLEAR COVER $\geq d_b$ AND CLEAR SPACING $\geq d_b$, AND STIRRUPS OR TIES THROUGHOUT L_d ARE PROVIDED.
   CATEGORY 1: CLEAR COVER $\geq d_b$ AND CLEAR SPACING $\geq 2d_b$.
   CATEGORY 2: CLEAR COVER $< d_b$ OR CLEAR SPACING $< 2d_b$.
4. FOR TOP BARS, MULTIPLY LAP LENGTH LISTED BY 1.30. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
5. FOR EPOXY COATED BARS, LAP LENGTHS SHALL BE MULTIPLIED BY 1.20.

1 TYPICAL REBAR LAP SPLICE SCHEDULE
SCALE:NOT TO SCALE



180° HOOKS



90° HOOKS

TYPICAL HOOK DIMENSIONS				
BAR SIZE	D	180° HOOKS		90° HOOKS
		A or G	J	A or G
#3	2¼"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3¾"	7"	5"	10"
#6	4½"	8"	6"	1'–0"
#7	5¼"	10"	7"	1'–2"
#8	6"	11"	8"	1'–4"
#9	9½"	1'–3"	11¾"	1'–7"
#10	10¾"	1'–5"	1'–1¼"	1'–10"
#11	12"	1'–7"	1'–2¾"	2'–0"

NOTES:
d_b = NOMINAL BAR DIAMETER.
D = FINISHED INSIDE BEND DIAMETER.
MINIMUM D = 6 d_b FOR #3 TO #8 BARS.
MINIMUM D = 8 d_b FOR #9 TO #11 BARS.
MINIMUM D = 10 d_b FOR #14 AND #18 BARS.

2 TYPICAL REBAR HOOK DETAILS
SCALE:NOT TO SCALE

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